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GAS JOURNAL

LIGHT ♦ HEAT ♦ POWER ♦ BYE-PRODUCTS

[Founded in 1849 as the "Journal of Gas Lighting."]

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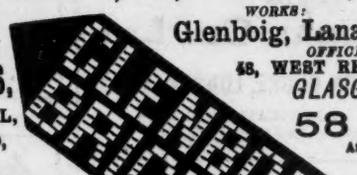

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EDITOR & PUBLISHER: WALTER KING. OFFICE: 11, BOLT COURT, FLEET ST., LONDON, E.C. 4.

VOL. CXLIX., No. 2968.] TUESDAY, MARCH 30, 1920. [72ND YEAR.

EDITORIAL NOTES.

Mr. Botley and the Situation.

THE present situation of all things that matter in progress and prosperity is one of acute and serious muddle. It is filled with anomalies; and they are tussling with one another and dragging in different directions, instead of in the one which would help to repair misfortune, and re-establish conditions that would be of advantage to all of us. Upon these matters Mr. C. F. Botley, of Hastings, in his Presidential Address to the Southern Association on Tuesday last, had regret to express and criticism to pass; and he did both well. The son is like the father, to whose memory a monument of indebtedness has been constructed by the gas profession for (long before the scientists had found out that it was the proper way) showing its members how to repress the bugbear of naphthalene. "Like the "father," because while prepared to tread the path of progress, he is not willing to go along the path made by the feet of the multitude without first instituting personal inquiry as to where it leads. We would sooner have a man who does this sort of thing than one who accepts the decision of the majority without exercising his own intellectual faculties. Though the one who examines may not be prepared to fall into line at once, his ultimate attitude will make of him a stronger man than the other; and if he is then a convert to one's own thinking, he will be the more forcible collaborator.

The President is as ardent a supporter of gas organizations as his father before him. The changes in the work of the gas industry are reflected in the changes and extensions that have been made in its organizations. The times have either compelled or have shown the wisdom of making fresh moves in organization. There are men who think the industry is now over-organized. Mr. Botley is not one of them; and it is clear that he cannot find any one of our organizations that is dispensable. Each has its place and its work in the system; and, if anything, there is pleading by the President for united support from the whole industry. This is necessary. At the same time he warns those who expect over-much from the organizations, as well as those who enter them in the belief that individual responsibility will have a large part of its substance cut away, and consequently there will be a freer life for the individual. He would like to see every gas undertaking—statutory or non-statutory—as a member of the National Gas Council; but membership will not remove by one tittle individual responsibility. Individual responsibility and co-operative action must work in their own places with plans harmonizing, and with intention and result reciprocal. It is clear, however, that the President feels that the National Gas Council has its limitations. Most decidedly it has. Otherwise there would be no need for the other organizations in the industry. Mr. Botley, in fact, draws-in the limitations fairly closely. "There are very few questions indeed which can be decided "on one basis; and even then there is the danger of a "decision being unconsciously influenced by the very large "undertakings, which is unfortunate when it is remembered "how small these are numerically compared with the bulk." Looking back over the late battle-stained years, looking at the present position, and glancing forward, we refuse endorsement to Mr. Botley's "few;" and, even if we could give it, we should claim an importance for the "few" which would put them above the operating plane of the individual concern. If the danger that is mentioned by the President exists, whose fault is it? Is not the Council the most democratic body in the whole gas industry? The system of election provides for the appointment of representatives by the gas undertakings, large and small, in every division of the country; so that it is the fault of the gas concerns themselves if their own particular magnitude and interests are not represented. "There is also," says the President, "the danger of the Council . . . being the "avenue of approach or of attack for the gas industry." Without the consolidated strength of the Council standing in the way, the danger existed of the avenue being wide open for approach to, and attack of, every individual undertaking. If we look—and it need not be any too carefully, for it is so plain—at the trend of things to-day, it is seen that the tendency is in every sphere of industry and commerce to deal with things on a national rather than on an individual basis; and the gas industry has to keep up with this tendency. The industry cannot escape the new fashions in methods of doing things; and if it has not machinery equal to the change of habits or method, it must naturally suffer the consequences.

There is surely plenty to disquiet every responsible and thinking man in the conditions that exist all round us. There is no certainty or stability in anything; and Mr. Botley, like the rest of us, is simply groping about amid it all to see if he can find something tangible to lay hold of which will afford him light, leading, and understanding. The decisions and standards, he says, that are set up to-day are abrogated or ignored to-morrow. Have the Government, he seriously inquires, no real plan? The negative answer—if "real" also signifies "comprehensive"—is to be found in their acts. Between these acts there is no co-ordination, and that is the trouble of it. Piecemeal scheming is the order of the day; our "super-men" (if such they actually are) appear incapable of viewing the situation and the reforms necessary as a whole. Confessedly, to do so would be a mighty task; but it should not be hard to investigate whether or not a scheme when propounded would fit in the whole without producing serious damage to the surroundings. It is because of this that the country has got into such miserable and injurious conditions, which are, in consequence, growing worse and worse the further we go. It is all chaos—financially, in the coal industry, and in the realms of labour generally. What is to be done? Is there no one to lead men and affairs aright? More men are at work to-day than during the war time; more machines are running on peace productions; more ships are sailing; and more locomotives and wagons are available. Yet the cost of living continues to ascend, labour seems more disturbed than ever, and much more has to be paid for any money required for capital purposes. The position is worse than while the war was being waged in all its severity, and while our substance was being blown into the air for destructive purposes, and for, through destruction, the realization of victory. And the trouble is that we cannot tell what the morrow has in store.

In the address, the chaotic position in the coal industry, which is so largely at the root of the misfortunes of the gas industry, was touched upon. Sympathy was also expressed with the Coal Controller. We are all too ready to blame that worthy, whose position is the most unenviable of any man's in the whole country. The Miners' Federation are now the real controllers; and the miners have hitherto done much as they please, through the force of numbers and the power of skill. Increases of wages have raised the price of coal higher than any other factor has done; and for the higher wages, they work shorter hours, and produce less per man. They will have no abatement made for bats, dirt, and refuse; all must go into the account now. While

it costs in wages a sovereign at least to produce a ton of coal [not 14s. as the address has it], the miners insist on the retention of the privilege of coal delivered for their own domestic use and comfort at 4s. per ton. Now they want more in wages. These are things from which the gas industry is suffering—from which the President is suffering (as he shows) acutely at Hastings, as is every other gas engineer in the country. The outlook is not cheerful in this respect, any more than it is in regard to the costs of labour generally. The country must, if it is to advance and not further recede, get its payments for labour on the new foundation of value for work done, in order to energize the individual worker, and thus raise efficiency and output. So far the workers have, through the activities of their unions, kept the wage increases well in line with the advances in the cost of living, which is now about 130 p.ct., or perhaps rather more, in excess of the pre-war rate. The President's compilation as to labour costs at the Glyne Gap works at Hastings shows that 130 p.ct. is about the increase for labour on the basis of cost per 1000 c.ft. of mixed gas made. But while this is so, while the cost of living is what it is, while labour is getting what it does, while everybody is squeezing us to drag from us by way of expenditure the last halfpenny of our earning power, Mr. Botley says: "If 5 p.ct. was considered a reasonable return for gas investments in pre-war days, surely to be consistent some-thing like 7 p.ct. would be reasonable nowadays." To be "consistent" the 5 p.ct. should now be 10 to 12 p.ct.; but, to be "reasonable" in the eyes of other people, we shall probably have to accept, if we are not content with, 6 or 7 p.ct. Gas dividends appear to be about the only thing in the wide world that are supposed not to have any right to conform to new standards.

Among other matters dealt with in the address, Mr. Botley, we observe, favours a 470 B.Th.U. (gross) gas. When the incentive arrives, as it will do, of selling on the heat-unit basis, and comparison comes to be made with the work of other men, we may see a revision of opinion in this respect. As to inerts in gas, he puts the thoughts of many other men into words. He favours the amalgamation of small gas undertakings with the large as one of the ways to economy; he exposes the financial conditions of the Hastings electricity undertaking; and he advocates co-operation between gas and electricity concerns. Hastings would be an excellent place for any large concentration of electrical plant to be next door to the Glyne Gap gas-works, so that fuel might pass direct from them to the electricity station to feed boilers or to be used direct (as occasion favoured) in gas-engines. Choice of fuel gives liberty in operation.

The address was an excellent one in matter and composition; and the delivery was such that there could be no failure to grasp the meaning of the President's views on the current situation. The question arises, What does the situation portend for the future?

Two-Stage and One-Stage Gas Production.

GAS manufacturing matters never were in such an interesting position as they are at the present time, through the proposal to sell gas on the heat-unit basis, the necessity for putting our coal resources to the best possible use, the making of the best provision of a labour-saving heating agent, and the liveliness that there is in connection with coal-carbonizing and other gas-making systems. From these points of view, individually and collectively, there could be a large amount of discussion. For the Institution meeting in June, the Society of British Gas Industries have made themselves responsible for a paper upon carbonizing processes; and we are hoping that it will be cast on such broad lines that a profitable discussion will result from it. Coal carbonization in future will have to be considered in relation to the production of the largest quantity of B.Th.U. in gaseous form from the coal handled, having regard to the economy-value of secondary products, and the putting at the disposal of consumers the gas that will be the most suitable for its divers uses. We do not know whether in the paper provision will be made which will give an opportunity for bringing to the surface information as to experiences with the complete gasification of coal. We hope there will be; if not, the paper will be lacking in completeness. The Institution ought as a body to be well in line with this development, and not burke it because it is looked upon by some as unorthodox.

The question of one-stage and two-stage gas production is surrounded by several interesting problems. Above all stand the capital costs, and coal and labour expenditure, per 100,000 B.Th.U. produced. Which is all-round the better for the gas industry—the two-stage or the one-stage system of gas production? The question is an economic one; and it has to be answered subject to circumstances. There are some engineers who stand positively aghast at the very mention of the idea that any part of the secondary products should be given up so as to get (say) 80 p.ct. of the thermal value of the coal into the gas-mains; and so they favour the continuance of the two-stage system—carbonizing the coal, saving the residuals, and making water gas from the coke. The matter has to be considered from the A of capital expenditure to the Z of the price of delivery of heat units to the gas consumer, combined with the character of the gas. There are to-day several workers in the field of complete gasification, either two-stage or one-stage—the latter with diminished, or entire stoppage of, output of secondary products. One thing that these workers have definitely determined is that the gas produced by complete gasification of coal is of a composition that has a closer similitude to coal gas ordinarily made than has the mixed gas produced by the two-stage process. But there are the light oils, the ammonia, the many other things that to relinquish even partially cuts against the grain of the stern conservatism that still obtains in many professional gas quarters. These are all matters for thorough investigation, not hasty decision. Even local circumstances will alter the case when determining whether a two-stage or a one-stage system of dealing with coal for gas production shall be adopted, whether the systems shall work side by side, or whether gas provided by complete gasification shall be used as a diluent in place of blue water gas. So we hope that the paper of the Society of British Gas Industries will be upon comprehensive lines, in order to supply good scope to the discussion; for the question of producing heat units has equal weight with that of basing charges upon them.

Heat Conservation and Gas Production.

MANY workers have, over a considerable number of years, studied the thermal efficiency of the coal-carbonizing and water-gas systems as practised on gas-works. But we have been moving very fast in our manufacturing processes and practices of late, and efficiences like other things have undergone change—for the better, where good management comprises efficient control. In order to obtain such control, it is necessary to know how the heat is distributed in the processes, and the demands that are made upon the heat to realize maximum results. However, we are afraid that rule-of-thumb still reigns in many gas-works; and that there heat losses are in excess of what they would be if supervision in this direction were of high-class order. Fortunately, knowledge of these matters is making progress in the industry; and more is now heard of thermal efficiencies both in respect of fuel and production. Everything points to growth in this direction; and the more rapid the growth, the sooner will the industry—speaking generally—raise the level of its heat efficiency and therefore of its results, and so curtail avoidable losses.

An extensive investigation of the question of heat conservation in relation principally to water-gas production has been made by Mr. Edward G. Stewart; and into the paper, which was read (in his absence by Mr. L. Lacey) at the meeting of the Southern Junior Gas Association on Friday, he had put a considerable amount of work, in which the thermal conditions are covered most completely. The paper is one more for study than comment, because Mr. Stewart has constructed his results on a foundation of fact, which is accepted, and over which there can be little dispute—so far as water gas is concerned. In any system of gas production, increased thermal efficiency can only be produced from what is at present misapplication, waste, or avoidable loss. When thermal efficiency is already on the best of lines, there can only be improvement by the utilization for auxiliary purposes of some of the heat described as lost. This is being done by its partial employment for steam-raising and superheating, and pre-heating air supplies to furnaces. But considering improvements in thermal efficiency by auxiliary means, or by departures in the methods of operation, one must be sure that the result justifies the means, and is not produced by an expenditure on capital, labour, or operation that overbalances the thermal gain.

It is clear that Mr. Stewart is not particularly enamoured

of steaming in vertical retorts. The points he made in this regard would, *primâ facie*, have greater importance if there was not a mass of experience which largely discounts what he has to say. That steaming in vertical retorts pays cannot be gainsaid; and any criticism has to get over the fact that those who have adopted steaming, and have now had an extensive experience of it, are not prepared to denounce, much less renounce, it. In Mr. Stewart's opinion, "difficulties of control, capital and working cost, coupled with thermal inefficiency, will prevent its general adoption in favour of separate manufacturing plants." While we do not submit this in depreciation of separate production of water gas, it must be said that we see no signs of any lag in the adoption of steaming in vertical retorts. As a matter of fact, the process of steaming gives results which are not obtained by carbonization in one stage, and the subsequent admixture of the coal gas with water gas. What these results are have frequently been explained; and Professor Cobb's "William Young" Memorial Lecture of 1918 will inform anyone who is ignorant of the advantages. Actual working results with steaming, on gas-works, in coke-oven plants, and in the shale-oil industry, confirm the theory, though there is here a field for research which should be lucrative in additional knowledge.

Mr. Stewart finds a remarkable absence of data regarding water-gas production in vertical retorts; and a matter that particularly concerns him is as to the consumption of coke. But can he supply us with any information as to a case where, in relation to coke used, the improved production in gas does not pay, on the heat unit basis, quite apart from the collateral benefits realized? The cost in coke or breeze for steam production can be approximately calculated; and, regarding the water gas made in the retort, Mr. Stewart works out figures based upon some quoted in the early days of systematic steaming, as given by Mr. J. E. Blundell, then of Macclesfield. He might also consider the case quoted by Mr. H. W. Woodall, in his Southern Association paper last November, in which 35,400 c.ft. of 400 B.Th.U. gas is made, giving a multiple of 14,160,000 B.Th.U. In this instance, it was stated that the coke available for sale is reduced by 25 p.ct. It would have been of interest if Mr. Woodall had supplied precise figures, as if a critic like Mr. Stewart were to construct a heat-balance from the figures recorded, he might have some difficulty in finding where sufficient heat came from to do all the work entailed in getting the gas, coke, and tar results referred to by Mr. Woodall. As to depreciation in the value of the coke caused by steaming, it is true that scarcity of coal provides a good market for coke; but there is the fact that from all quarters reports come that there is no trouble in disposing of it, and that it burns brightly and well. Of course, as ever, there are variations in coke according to the physical characteristics of the coal; and naturally ash would be greater and volatile matter less in steamed than in unsteamed coke. Analyses of coke produced from the same coals with and without steaming would be useful.

The paper is highly interesting and instructive. Our only regret is that the author did not use a little more compression in preparing it. We say this not from any want of appreciation or due sense of value, but because short papers, we are confident, attract more readers than long ones; and this subject of heat conservation is one to which the attention of many gas men requires to be drawn.

Amendment of the Capital Issues Bill.

THE Public Utility Companies (Capital Issues) Bill, which was amended in several details by Standing Committee B, is to undergo a further dressing-up at the instance of the Board of Trade. This was expected, as, when it was under consideration by the Committee, Mr. Bridgeman, the Parliamentary Secretary to the Board, stated that the Board agreed to certain changes, but the form of the clauses giving them effect would have to be considered. The further revision proposed has appeared in the "Votes." The Bill is to be expanded in its application, so that it will include not only gas and water, but hydraulic power and electricity and tramway undertakings—including light railways constructed wholly or mainly on public roads. The Ministry of Transport are to be given a voice in relation to electricity and tramway undertakings, so that the Board of Trade and the Ministry of Transport will, as is appropriate, have to give their consent. But it will be with the Board of Trade only that gas, water, and hydraulic power companies will have to do. Another amendment provides for the "sale to the "public" of stock being altered to "subscription by the "public," and at "a *fixed* price lower than the nominal "amount of the stock;" and all allotments of such stock are to be made as nearly as possible *pro ratâ*. The insertion of the word "fixed," and the provision as to allotments are among the proposed amendments. There seems on the face of them to be no ground for objection to the amendments, which in part add to liberty, and in part supplement the conditions on which the issues may be made.

Trade Combinations.

A TRADE combination can be either helpful or otherwise to the industry with which it is identified. But it is at times difficult on the evidence available to judge whether the combination is, having regard to a fair profit, rendering the maximum help through the prices charged, and whether, if such help is rendered, it compensates for the restriction brought about by the combination of the limits of competition for business. As will be seen by our "Electric Supply "Memoranda" to-day, a Sub-Committee, appointed by the Standing Committee on Trusts under the Profiteering Act, has reported on the results, in relation to prices, of the trade combination in the electric-lamp industry. If all that is published in the report is beyond question, then the tale is not a pleasant one, nor are the thanks of the electricity supply industry due to the combination which has controlled prices to the public in such measure that this alone has considerably depreciated one of the factors that make for progress in the supply of a lighting agent. If there is no answer to the report, then it shows that the combination has enabled the manufacturers to make considerable profits, and to regulate prices in such a way that competition has practically been non-existent so far as the public are concerned. There are the associated and the non-associated electric lamp manufacturers; but the associated (so it is declared) rule the roost to such an extent that the retailers, while securing lamps at a lower price from the non-associated firms, sell the lamps at the same figure as they do those obtained from the associated makers. Thus are the public completely denied any participation in any advantage derived from competition either among manufacturers or retailers, and, moreover, have to pay the higher prices fixed by the combination. The conditions in the gas industry are largely different. Gas undertakings are the principal distributors of gas appliances; and they would not bind themselves, as evidently the electric lamp retailers do, to conditions which deprive the public of all price advantage. In the electric lamp industry, the law of supply and demand, and the benefits of competition are completely annulled by the absolute governance of the associated makers.

If this sort of thing is proved to be the result of trade combination, the country will not stand combines. The Sub-Committee, in their report on the electric lamp business, consider that the operations of an Association which so effectively controls an important industry should be subjected to public supervision and control. They are of opinion that this would best be attained by giving statutory effect to the recommendations of the Committee on Trusts. These, in brief, are that there should now be established a Department of State charged with the duty of informing itself as to the nature, extent, and development of combinations of all kinds in so far as they tend to the restraint of trade and the creation of monopolies, and of instituting preliminary inquiry into complaints made regarding them. It is also suggested that a tribunal should be set up to which the Department could apply for powers to obtain particular information, and would refer for full investigation cases in which combinations appear to act injuriously to the public interest.

A Halt on the Brink of a Coal Stoppage.

Last week was full of alarms and ill-forebodings. Gas engineers looked at their poor stocks of coal; and then consulted the last newspaper to hand to ascertain whether there was a ray of hope coming through the gloom of the trouble with the people who, finding the nationalization avenue closed to them, had determined to absorb within their own pockets all the coal profits, and perhaps something more—and this not in the interests of their fellow-creatures. Things looked very black most of the week; and it was not until the papers were opened on Saturday morning that one felt there was a chance of the matter being subject to a

little more reason on the side of the miners. Their original claim was for an increase of 3s. a shift for coal workers over 16, and 1s. 6d. a shift for boys below that age. An interview with the Coal Controller brought from him alternative proposals: (1) 1s. 6d. a day for men, and 6d. a day for the boys, or (2) a 20 p.ct. increase on gross wages, excluding the war wage and Sankey award—together 5s. These terms the Executive of the Miners' Federation rejected; and then came talk of a national coal strike and the prosecution of the preliminaries for taking a strike ballot—all this to force the Government to yield 3s. and 1s. 6d. a day, and so distribute among the miners all the balance of profit from the high prices of exported coal, and something substantially more. Then followed a conference with the Prime Minister; and the 6d. for boys in the offer of the Coal Controller was converted to 9d. The Government also suggested that, if the percentage rate was accepted, they would guarantee that no man should receive less than 1s. 6d. per shift, which would thus become the minimum increase. This position seemed to be more acceptable to the miners' delegates. The percentage rate is something not to be lightly refused, because it gives the men scope to earn more, being based on production, and so there will be an incentive to increase output, while the lower paid men are assured of the 1s. 6d. increase. This proposal means an additional payment per annum of 30 millions, whether or not the prices of export coal continue at high level. But this is better than the 45 to 49 millions that the original claim represented; and if the adoption of the percentage rate will lead to more coal being raised, there will be some compensations for the increased burden. [We shall not know before going to press the result of the interview that the representatives of the Miners' Federation were having yesterday with the Premier; but it is understood that they want the percentage rate fixed at a higher level, and the guaranteed minimum at the 3s. for adults and 1s. 6d. for boys first asked for.]

Bunkers and Bunkum.

As things are, it is very doubtful whether the abnormal profits from exports and bunkers will stand the cost of any further increase, because, in the midst of all the trouble last week, came the announcement that the price of bunker coal would be reduced by something like 40s. per ton as from April 1; and this will mean to industry roughly £24,000,000. The miners strongly resented this, as they regarded it as a piece of strategy to deprive them of the prize they had set out to win—quite overlooking the fact that when they were talking of cheapening industrial coal it was with the object of reducing the cost of living generally, when talking of nationalization it was "in the interests of the whole community," but now that it comes to reducing the cost of bunkers which would help raw materials and food to be shipped here at lower rates—well that is altogether wrong, because the miners had set their hearts on all the margin of abnormal export profits and something over. However, we hope that a settlement will be come to, but not by further concession. The Government must stand firm upon their offer if they wish to retain the respect of the country, though, with a recession of export profits, the price of home coal will most certainly have to be increased. Anyway, that is how it looks. Yet Mr. Adamson, one of the miners' representatives in the House of Commons, said the other day that it was erroneous to suppose the miners pushed their interests to the exclusion of the general interests of the country. We seem to have misjudged them; but anyway before accepting Mr. Adamson's statement, we will think over it again, in the light of recent events.

Government and Benzol Production.

The time may come when the Government will again ask the owners of gas undertakings to wash their gas for the production of benzol. There has been a great falling-off in the practice since the war. But the Government are almost daily having it impressed upon them that the demand for motor spirit is outstripping, or has outstripped, the supply, and that this partly accounts for the flight in price that petrol especially has made. These facts are attracting the attention of the Government, as was evident from a reply given by Mr. Bridgeman, the Parliamentary Secretary to the Board of Trade, to a question put to him in the House the other day. The Board have come to the conclusion that the most effective method of preventing an increase in price is the use of other forms of liquid or gaseous fuel. The Board are examining the various possibilities with the aid of the Board of Fuel Research. There are at the moment difficulties in the way of using town gas for the purpose, mainly owing to the position of coal stocks. Mr. Bridgeman hopes, however, that it will be possible to increase the output of benzol; but the limits to this are largely set by the present demand for gas and metallurgical coke. Alcohol, and the provision of a cheap and efficient denaturant, are to be the subjects of a close investigation; but there is no expectation that any immediate relief will come from this source.

To Increase Production.

The Government have set up a Committee, with Sir Stephenson Kent, K.C.B., as Chairman, for the purpose of considering and advising as to the best means of securing the greatest possible production, consistent with the permanent well-being of industry and of the employers and workpeople. The gas industry should have something to say to the Committee as to the part that it can take in this work in providing industry with not only power but heat. Heat in industry is as important as power; but the Government do not seem to be quite alive to the fact. The paper that Mr. H. M. Thornton recently read before the Royal Society of Arts should provide suggestions for evidence to place before the Committee.

Summer Time.

It is here again. All timepieces were put forward by one hour, or should have been, last Sunday morning; and at 2 o'clock in the morning of Sept. 27, the hour's readjustment is to be made. We like the change on account of the longer summer evenings. It was owing to the benefits that were expected would accrue to the people that the proposal was originally made; it was the coal position that induced the Government to make the experiment. The coal situation is worse than ever; so that anything which will help to diminish the consumption of coal is an important economic advantage.

Decimal Coinage.

There has not been any excitement over the fact that the report of the Royal Commission on Decimal Coinage, presided over by Lord Emmott, is against a change being made. Nobody other than the decimal enthusiasts seems to think we shall be a penny the worse, nor if the change was made should we be a penny the better off, than we shall be under current coinage conditions. Of course, we shall be told this is all a mistake; and that even a majority on a Royal Commission may commit a very grave error. So far as we are concerned, we are quite content to abide by their decision. It removes one piece of uncertainty in regard to prepayment meters. But, of course, the question whether we are to have nickel coinage is still in the balance. Anyway, with the country in the disturbed state that it is in at the present time, it would be folly to add another to our difficulties.

Carbon Monoxide and Methane in Industrial Gas.

Early in February we had Mr. W. H. Patchell, a well-known Electrical Engineer, accompanying Prof. Bone and others to interview the President of the Board of Trade, to try to persuade him to put fresh shackles on the gas industry. Whether their amiable intentions will come to anything, or whether the President of the Board of Trade will regard the matter from the practical standpoint, and not from the exalted platform Prof. Bone has constructed for himself, of course cannot be said. But it is remarkably interesting to find that Mr. Patchell does not professionally practise what he apparently went to Whitehall Gardens to support; and, of course, he is quite right. It will be remembered that the deputation were out for fixing a "net" calorific value upon gas, for a minimum content of 20 p.ct. of methane, a maximum content of 20 p.ct. of carbon monoxide, and other matters. A paper has since Mr. Patchell's visit to Whitehall Gardens been read by him at a meeting of the Institution of Electrical Engineers. From it, it is learned that the Hoffmann Manufacturing Company, Ltd., was some time ago requiring a gas plant for an extension of their works for providing gas for heating purposes and for driving 500 H.P. gas-engines of the Premier Company's type. The gas plant selected is of the producer form on the "Lymn" system, with ammonia recovery. In the abstract of the paper before us, we do not see the composition of the gas

stated; but we know approximately what it is. All we directly learn from the abstract is that the variations in composition are very slight, considering the different qualities of coal used. The calorific value is quoted at 134·79 and 139·6 B.Th.U. In view of Mr. Patchell's mission (in company with Prof. Bone and others) to the Board of Trade, we should like him to give a complete analysis of the gas that was thought good enough for the Hoffmann Manufacturing Company, so as to tell us how much methane there is in it, and how much carbon monoxide. Of course, for furnace heating a high percentage of carbon monoxide is valuable; and this is obtained with producer gas. The percentage of methane, on the other hand, is very low. But Mr. Patchell went to Whitehall Gardens to support a case which was largely based on the toxicity of carbon monoxide.

PERSONAL.

Mr. ROBERT WARDELL is relinquishing his position as Resident Engineer at the Tottenham Gas-Works, and has been appointed Assistant Manager to the Peterborough Gas Company.

Mr. ERNEST T. LORD, the Engineer and Manager of the Rockhampton (Queensland) Gas-Works, has been selected to fill the Assistant Engineer's position at Brisbane, vacant by the departure of Mr. W. H. A. Chester for England. Mr. Lord has been at Rockhampton for some three years, during which time the gas-works have been entirely remodelled, and much of the plant duplicated and re-erected above flood-levels. The latest figures show that the Rockhampton works are now making more than 50 million c.ft. of gas per annum; while Brisbane is making over 500 millions. Under the guidance of the Chief Engineer (Mr. C. F. Broadhead), the Brisbane Company have recently completed an installation of Glover-West vertical retorts, which are about to be brought into operation.

Allusion was made at the annual meeting of the Eckington and Mosboro Gas Company to the valuable services rendered during the last 35 years by the retiring Manager, Mr. WILLIAM HUGHES. After beginning his career in the Liverpool gas-works, he went to Birmingham. On taking up the position at Eckington, he found the works in a very dilapidated condition; but his personal efforts have since transformed them into a model gas-works. When he took up his duties there in 1885, the output was 8 million c.ft. per annum, and the sale of gas 5000 c.ft. per ton of coal; while now the annual production is 20 millions, and the sale per ton 12,000 c.ft. Though over seventy years of age, Mr. Hughes is still very active. During his long residence in the district, he has won universal respect.

The Minister of Transport, in pursuance of his powers under the Electricity (Supply) Act, 1919, has appointed Sir HARRY E. HAWARD, the Comptroller of the London County Council, to be a Commissioner under the Act. The offer of this appointment was referred to in the "JOURNAL" for March 9 [p. 552].

Addressing the shareholders at the annual meeting of the Staveley Gas Light and Coke Company, the Chairman (Mr. F. Hardwick) expressed regret at the loss the Company would sustain by the removal of their Manager, Mr. J. W. HAYES, to Eckington. His services would, however, still be available as a Director. It was mentioned that the Board had appointed Mr. FORD to succeed Mr. Hayes as Manager.

Mr. WALTER CRAGG recently retired, after 43 years' service with the Birmingham Gas Department. He was a member of the General Office staff. At a meeting last week of the Gas Committee, the Lord Mayor (Alderman W. A. Cadbury) presented to Mr. Cragg an illuminated address, expressing appreciation of his long and loyal service. Alderman Lloyd (the Chairman of the Committee) stated that Mr. Cragg entered the gas office in 1877.

To succeed Sir Harry Haward as Comptroller, the General Purposes Committee of the London County Council recommend the promotion of the Deputy-Comptroller, Mr. C. D. JOHNSON, who entered the service of the Metropolitan Board of Works in the year 1885.

OBITUARY.

Mr. GEORGE LAMB, the Public Lighting Superintendent of the Newcastle-upon-Tyne Corporation, died on the 24th inst. after three weeks' illness, at the age of 68. He had been in the service of the Corporation for 42 years, and during the whole period served them faithfully. Mr. Lamb was a pioneer in this country in the adoption of apparatus for lighting and extinguishing lamps by means of pressure-waves. The installation in Newcastle is, we understand, the largest in the country, numbering 7000 lamps. His knowledge and experience of automatic lighting apparatus were known far and wide; and his advice was sought on the subject from many parts of the world. Mr. Lamb leaves a widow, three sons, and four daughters. One son assisted his father for eleven years.

ELECTRICITY SUPPLY MEMORANDA.

NOT long ago, when the Electric Lamp Manufacturers' Association reduced the price of their lamps, the explanatory statement of how this was accomplished, despite the higher costs of labour and materials, gave one the impression that the reduction was made possible by good organization and by the savings produced by works' economies, mixed with a certain amount of benevolence and self-sacrifice on the part of the associated firms, and all in the interests of the public and the electricity supply industry. Altruism, according to print, could not have been better illustrated. The revelations made in the report of a Sub-Committee appointed by the Standing Committee on Trusts under the Profiteering Act, to inquire into the existence of any trust or trade combination in the electric lamp industry, rather take the gilt off the excellent character conferred on the associated manufacturers when the reduction in price was made, and put upon them the guilt of heavy profiteering. At the same time, confidence has been shaken in profiteering reports of this nature, since the mess that was made in regard to benzol by the Sub-Committee on motor spirit prices in their recently issued report; so that, for the time being, or until some defence is put-up by the accused, we will content ourselves with lightly touching on the conclusions of the Sub-Committee, which conclusions have been arrived at unanimously. They are of such a specific character that no one but those implicated can possibly possess the materials with which to confirm or disprove them.

Profiteering.

Lamp Manufacturers' Control of Output and Prices.

The Electric Lamp Manufacturers' Association include from 90 to 95 p.ct. of the industry. They (so report states) control factors and retailers, fix prices at all stages, and regulate output, which suggests that their manœuvres are of very complete order. But this, it is alleged, produces an ugly result. The prices fixed by the Association become the standard ones for all lamps sold in this country, whether made by the Association or non-associated manufacturers, or imported from abroad. The manufacturers outside the Association produce and sell lamps of comparable quality to the trade (they would not do this at a loss), at a lower price than the associated firms. But though the non-associated firms' lamps are sold to retailers at a lower price, they are sold to the public at the same price as the Association lamps; so that the larger profit goes wholly to the distributors. Therefore, the only competition is as to trade discounts; and the public obtain no advantage from sale at competing prices. From this the Sub-Committee make the deduction that either the Association manufacturers are making an undue profit, or they manufacture less economically than the non-Association makers. For standard vacuum lamps, the Sub-Committee conclude the public are being charged about 33 p.ct. too much. Those sold at 3s., it is considered should be sold at 2s.; and the distributors would still have a satisfactory working profit. Concerning these allegations, it must be remembered that the Sub-Committee have had the advantage of investigating the data from the opposing standpoints of the associated and non-associated firms. It is further asserted that 1¼ million "half-watt" lamps sold to the public in 1919 at 12s. 6d. were purchased in Holland by the three associated manufacturers at 3s. per lamp; while 8s. would have left an ample margin for the importers and distributors. The limitation upon output imposed by the Association on licensees is, the Sub-Committee say, altogether contrary to the best interests of the industry and the consumers; and they appear to detect the possibility of an international combination, which would be able to control supplies and dominate prices over a considerable part of the world.

The Public Pays.

In the report itself some further details are given as to prices; and the public disclosures cannot have been an altogether pleasant event for the manufacturers. It is declared that, apart from any reduction in manufacturers' prices, it should be possible by economies in the cost of distribution alone to reduce the price of lamps to the public by 6d. each. The fixed price policy, however, precludes any such economies being made in respect of distribution margins. The policy works out in a very generous way to the small retailer, but it is distinctly lavish to the large retailer. There is no doubt whatever that, in view of the fact that the retailers could obtain a larger profit by pushing the non-associated lamps, the public demand for the associated makers' lamps is stimulated by the generous advertising campaign in which they have indulged. The standard-price policy seems, according to the report, to have been an institution of some years' duration. This is suggested by the following statement of the Sub-Committee: That because of the standard price policy, the public were compelled to pay the same price for non-Association and Association lamps; the whole price advantage of the former (which to the factor was 9½d. in 1912 and 2¾d. in recent years) being denied to the householder. That in 1912 lamps bought by the British householder at 2s. 6d. were sold by the manufacturers (presumably at a manufacturing profit) to large factors at 9d. That between September, 1913, and April, 1917, lamps bought by

the British householder at 2s. 2d. were sold by the manufacturers (presumably at a manufacturing profit) at 6d. for export. That at the present time lamps bought by the British householder at 3s. are sold by the manufacturers (presumably at a manufacturing profit) at 1s. 4¾d. for export. It is agreed by the Sub-Committee that had the price of lamps been uncontrolled by any Association during the war, or had the Association so desired, a much higher retail price could have easily been obtained. The prices fixed by the Association are maximum as well as minimum; and it is just as much a breach of agreement to sell lamps above the fixed price as to sell below it. During some periods of the war, in view of the limitations of imports, the Association had a stabilizing influence on prices in the United Kingdom; but it could equally effectively during time of plenty prevent them from falling as far as they ought.

The Manufacturers' Profit.

The foregoing information is accompanied by some particulars as to the profits of the lamp makers. The present-day average factory cost of lamps sold to the public at 3s. and 3s. 6d. varies from 9d. to 1s. 4d. per lamp, according to factory, process, and materials used. Inordinate profits were enjoyed by lamp manufacturers in the years immediately before the war. In 1913 four manufacturers made on the average 9½d. profit on lamps which cost just over 11d. to produce and sell—a profit of over 86 p.ct. on gross cost. Last year the costs of producing and selling appear to have risen comparatively more than the price received; and the profit, according to these figures, was then only 4¾d. on a lamp costing 1s. 9½d. to produce and sell. Taking associated and non-associated firms together, the manufacturers' average margin of selling price over factory cost may be taken as being about 1s. per lamp. Some part of this must be earmarked for advertising, selling expenses, research, patent fees or royalties, and reserves against patent litigation. The rest is profit. The Sub-Committee consider that the 5d. per lamp allowed by the Association for selling charges is more than is necessary. We should think that the electricity industry will be mightily pleased over this report. The simple statement of its charge is that, through hard times and good times, the associated lamp makers and lamp retailers have been making more than they should have done from the public and the industry, so helping to stem-back progress.

Speculation in Power Stations.

The Electrical Correspondent of "The Times Engineering Supplement" has an article entitled "Power for London." The Metropolis has for many years been a difficult problem in regard to electricity supply; and the labour, the argument, the schemes, and the parliamentary fights have all left things much as they were. As the correspondent says, there is no technical mystery about the matter; it is all a question of politics and finance; and at least a quarter of a million of money has been spent in getting nowhere. As was recently recorded in the "Memoranda," the London electricity companies are now seeking to combine for the purpose of doing something which will commend itself to the Electricity Commissioners, and give to the companies eternal life, instead of becoming extinct in 1931. The companies, according to the correspondent, have long been stubbornly entrenched; and to him it will be a matter of enjoyment to see them come over the top. He seems inclined to be a bit speculative, and rather favours "enterprise" in putting down a large generating power station, and waiting for business to turn-up. Such a "power station would stand as the equivalent of a small Niagara; and, instead of estimates, there would be readiness to serve at an attractive price." He cites the case of the North Metropolitan Power Company. "The mere existence of generating plant on the right spot, with low costs, has certainly attracted custom from local distributing authorities who started with the intention of being self-contained. Readiness to serve is in all business very compelling." The conditions have altered since the North Metropolitan Power Company began the bulk supply business. The Company have largely developed their own stations. With a capital expenditure on the high level of to-day, a great flight has been made in the degree of speculation involved in engaging in a mammoth scheme of the kind. There must be some definite pre-assurance of a big business; and so there must be pre-organization and a fair agreement. It does not pay to have heavy capital expenditure lying idle for years, waiting for business to come. The heavier the capital expenditure, the higher must be the costs for energy at the outset. With an electric station, the custom must be there before low costs can be realized.

Lower-Grade Gas and Boiler-Firing.

The "Electrical Times" has been showing some interest in the low-grade gas demonstrations that Mr. George Helps made at Westminster; and Mr. J. M. Kennedy, in a letter in its columns, seems to think that Mr. Helps's claim that it will pay electricity stations to scrap their coal plant and burn under their boilers gas produced by a complete coal gasification scheme is a bit too sweeping. If all boilers in everyday work would give, continuously running on coal, 75 p.ct. efficiency (which they are far from doing, though there are modern boilers that will do so), and this was the only consideration, then there would be more validity in Mr. Kennedy's doubts as to there being little value to the generating station in complete gasification prior to the use of the clean fuel in the boiler-house. If 20 or 25 p.ct. of the heat of the coal is used or lost in the complete gasification process, and only 75 p.ct. of the heat value of the resulting gas is usefully employed in the boiler, then there would not be much in the system; and it would be better to turn to the direct use of the gas in the cylinders of gas-engines. In the Bonecourt boiler, however, upwards of 90 p.ct. efficiency on the gas consumed is obtained. But this is a question that must certainly not be looked at alone from the point of view of thermal efficiency. If it is, then, as Mr. Kennedy says, there is nothing very revolutionary about it. There are other points to be taken into consideration. The use of gas would do away with coal purchase, transport, and handling; no coal storage would be needed; no chimneys would be required; the gaseous fuel would be piped to the generating station, and be always available. The temperatures under the boilers would be uniformly maintained, and not varied by the differences in the conditions of the fuel bed. Labour would be saved by the fuel being piped to the boilers in the most utilizable form, and by the absence of cleaning and ash removal. But at present the gas industry has for sale as coke 40 to 50 p.ct. of the weight of coal carbonized, with and without charge steaming. Electrical engineers are learning how to derive economy and good boiler conditions by the use of this coke, and so save coal.

High Capital Expenditure.

Big electricity extension schemes by individual undertakings are being proposed throughout the country, and without any reference to the question of co-operative generation. There is a perfect flood of new plans; and the figures suggested as the required capital outlay look out of all proportion to the old-time need. This is due to the fact that capital expenditure was always heavy in connection with electricity supply; and as costs have risen by 200 to 300 p.ct., the sums are naturally heavy. The new standard of expenditure for work done will increase largely the interest and repayment items. Municipal corporations have lately been issuing loans at 6 p.ct.; and the value of the old local loan stock, paying 3 p.ct., stands at the time of writing at only about £50 p.ct. This goes to show that electricity undertakings on all new expenditure will find the burden weightier, and so will the consumers. It is seen that the Electricity Commissioners are giving sanction fairly freely to new loans; so it must be taken that the work is pressingly necessary. In the case of the Marylebone Borough Council, however, the Commissioners have suggested that the Council, instead of adding to their own plant, shall purchase electric current from another source. But the Council urge that sanction be given to the plan they themselves prefer. On the other hand, the Hackney Borough Council have made applications for £171,150 and £134,430—together £305,580; and the Commissioners have signified their assent, subject to the observations of the London County Council. The Finance Committee of the Council have reported. They are solicitous as to whether any of the older plant has become obsolete, or whether any such plant will be displaced on the introduction of new machinery. Should any displacement occur, the Finance Committee consider that the Borough Council should be required to account for the outstanding balances on loans for the plant concerned. The expenditure now proposed involves an addition of no less than 73 p.ct. to the indebtedness of the Borough Council on account of the electricity undertaking; and this large increase must necessarily have a very important bearing on the finances of the undertaking. The Commissioners should also take steps to ensure, with the heavy expenditures that are now being, or are about to be, incurred, that the undertakings are made entirely self-supporting, as company concerns have to be, and so protect the general body of ratepayers from having to contribute to their support, although the greater part of them do not use electric current.

Manchester and District Junior Gas Association.—The twentieth annual meeting will be held at the Grosvenor Hotel, Deansgate, Manchester, on Saturday, April 10, at 3 o'clock. After the election of officers, Mr. J. Bridge, of Bolton, will deliver his Presidential Address. Tea will be followed by a social evening.

Eastern Counties Association Commercial Section.—At a commercial meeting of the Eastern Counties Gas Managers' Association, Western Section, held at Grantham last Tuesday, Mr. G. R. Casterton (the Secretary and Treasurer) tendered his resignation, which was accepted with regret. The Chairman (Mr. H. Wimhurst) spoke in very feeling terms of the termination of the Secretary's work, and thanked him on behalf of himself and the members, and also handed him a cheque for fifteen guineas in recognition of his fourteen years' service. The Secretary replied, and thanked the Chairman for his kind words and the members generally for their handsome gift. Mr. Wimhurst then said he was about to sever his connection with the chair, as he was retiring from the management of the Sleaford Gas-Works; and after expressions of thanks to Mr. Wimhurst for past services, his resignation was accepted with regret. His successor in the chair is Mr. W. H. Mainwaring (Lincoln); and the Vice-Chairman is Mr. L. Birchmore (Louth). By the unanimous vote of the members, Mr. Herbert Green (Stamford) was appointed Secretary and Treasurer.

TULLY PLANT AT GRANTHAM GAS-WORKS.

First Experiences.

LATELY in technical circles one topic of conversation among the many has been the operation at the Grantham Gas-Works of the Tully carburetted-hydrogen plant. The facts that this plant has been adopted by Mr. R. G. Shadbolt, the Engineer of the Grantham Gas Company, and that for a considerable number of years Mr. Shadbolt has been an advocate of the supply of lower grade gas, give considerable interest to this innovation in his practice. That he has adopted a plant of this kind is sufficient assurance to his colleagues in the gas profession that there was on his part preliminary satisfaction that it would not only comply with the makers' promises, but that it would meet his needs.

In order to obtain information as to what Mr. Shadbolt was doing, we communicated with him, with the result that he has favoured us with a few notes concerning the plant, and the short period of working with a view to their presentation to our readers. So far as the results are concerned, these must be taken as purely introductory; and after there has been a good term of working, we may anticipate that Mr. Shadbolt will give to his professional colleagues, through our columns, definite particulars as to the results he has obtained. It will be quite understood that during the period the plant has been in operation, the work has been more or less of an experimental nature, in order to arrive at the best possible method of working under the conditions existing at Grantham.

EXPERIMENTAL WORKING AND ITS LESSONS.

The new plant was installed towards the end of last year. It has a daily capacity of 300,000 c.ft. Up to last week, it had only been in operation some seven weeks—the first fortnight in the contractors' hands; and since then, under the direction of Mr. Shadbolt, his own men have been responsible for the working. The first thing that has been proved is that the output capacity of the plant is up to guarantee, alike when using "all coke," "all coal," or mixtures of both. The plant has been "run" and has "stood-down" for various periods—as from one eight-hour shift working, and two eight-hour shifts standing, to the reverse; also continuous working throughout the twenty-four hours. Thus it will be seen the time, as already remarked, has been largely occupied in experimental running for information purposes.

From this experimental operation it has been ascertained that the best output results are obtained when continuously working the plant. The "all-coal" working necessitates only a few slight modifications in handling as compared with "all-coke" working. But the modifications are not of any moment. It has also been shown beyond doubt that non-coking coals are the most easily worked in the plant.

After testing and proving the plant with coke, a change was quickly made to coal. In this case a Derbyshire steam nut coal, which worked more easily than the Company's own coke (which is very friable), proved to be capable of giving a gas much nearer normal gas in character and behaviour than blue water gas. This experience will be valuable in connection with the question of dilution.

The plant connections are so arranged in relation to the foul main from the retort-house that the two nascent gases are mixed hot; and when working three full shifts of carburetted hydrogen gas for twenty-four hours, the relief holder simply acts as a compensator, and practically all the carburetted hydrogen gas made is thus treated.

WORKING RESULTS.

It is under the foregoing conditions that the best results are being obtained; and the addition of 20 to 25 p.ct. of carburetted hydrogen gas of nominally 400 B.Th.U. gross raises the total mixture (coal gas from the retort-house, 450 B.Th.U.) to from 470 to 475 B.Th.U. Beyond (say) 25 p.ct. addition of hot carburetted hydrogen gas, the calorific value falls, but by very little per unit of addition. Mr. Shadbolt informs us that, owing to the oscillating nature of production (blow and run), and the varying quality of the gas during the run, it is impracticable to test the gas calorimetrically as it issues from the plant. This must be done by gas backed-through the holder connections while the plant is standing-off; and, in the case of the carburetted hydrogen gas (from coal), all the vapours have then been condensed out, and nothing but fixed gas remains to be tested. Under these conditions, gases condensed and purified show in the case of blue water gas (all coke), an average of 320 B.Th.U. gross, and in the case of carburetted hydrogen gas (all coal) an average of 400 B.Th.U. gross.

The quantity of gas per ton of fuel varies, but may be taken to average in the case of coke 60,000 c.ft. per ton, and in the case of coal 50,000 c.ft. per ton, and proportionately with mixtures. These yields produce 19,200,000 B.Th.U. per ton of coke, and 20,000,000 B.Th.U. per ton of coal. As a matter of fact, the yields are actually higher, but the figures quoted are safe averages.

THE B.TH.U. RESULTS.

As already indicated, the Grantham plant so far has been worked much more with "all coal" than with "all coke." The total "coal only" passed through the plant to the date at which Mr. Shadbolt communicated the particulars is 126 tons, which the records show have produced 6,829,000 c.ft. of gas, or 54,198 c.ft. per ton. The average of 51 calorific tests taken as already indicated equals 398·1 B.Th.U. gross, giving 21,576,223 B.Th.U. gross per ton of coal.

LIMITS OF PRESENT EXPERIMENTAL WORKING.

We learn from the communicated information that not on any occasion has enrichment—either tar or oil—been used, as Mr. Shadbolt preferred to ascertain the possibilities of the plant on bare fuels, before initiating tests in carburation, the extent of which in this plant he is not yet acquainted with, though provision is made for it. So far no attempt has been made to use gas coal alone in the plant. The experiments in this direction have been with gas coal mixed with coke in varying proportions—up to half coal and half coke, within which limits the results have been proportionate to the separate "all coal" and "all coke" working. But Mr. Shadbolt sees no reason why (say) all but the best coking coal should not be used without any admixture of coke.

OTHER NOTES.

Two features of interest have been already noted in regard to the "all-coal" working—viz., the fixed gas contains about 1·4 p.ct. of hydrocarbons, and the tar some 25 p.ct. or so of light oils.

The yield of tar would appear to be about the same in quantity as in ordinary working, but is more of an emulsion with a higher percentage of water than ordinary tar.

Ammonia is very elusive; and the only liquor that has yet been obtained shows 0·2 p.ct. of ammonia.

As to inerts, Mr. Shadbolt has not troubled much about them, but has kept an eye on the CO_2, to see that it does not exceed reasonable bounds.

These notes, we are sure, will be very acceptable to our technical readers. It is hoped that at a later date we shall have from Mr. Shadbolt the results of more extensive working, and thus the best of conclusive figures.

SIXTY YEARS AGO.

[From the "Journal" for March, 1860.]

The Commercial Classes and Legislation.—The writer of the Money Articles of "The Times" has lately displayed a great amount of virtuous indignation against the Railway Directors' Association, on account of their attempts to secure powers to alter the limits of charge imposed by the original Acts of Parliament establishing the various railway companies. It may seriously be questioned whether the united body of Directors be really wise in the course they have adopted in this matter; and, for our own part, we are convinced that the interests of the shareholders in these concerns would be advanced by a lowering, rather than by a raising, of the tariffs. But this is a question to be left to the various parties interested; and really the railway companies have been so shamefully robbed by the public, and by public authorities, in every possible manner, that we can easily understand that it may frequently be necessary for them to seek for a relaxation from the conditions of their original bargains. Even now, a day hardly passes without the occurrence of some attempt to extort more money from railway, gas, and water companies, under pretext of parochial wants; and, in face of these constantly augmenting charges, there seems to be no defence but in the power on the part of the companies to increase their tolls. At the same time, we must add that we quite agree with the writer in question, that it would be very desirable to establish some description of superintendence on the part of the commercial classes over the measures brought before Parliament, whether in the shape of Public or Private Bills. At the present day, emphatically, the property of no person is safe from the crotchets of interested or theoretical dabblers in legislation; and, if the trading classes be exposed to new burthens, through the tampering of railway officials with their parliamentary powers, they may be still more seriously affected by such measures as are from time to time presented by the Social Science-mongers. The tale of the enactment of a stringent Nuisances Removal Act, under the name of the Smoke Nuisance Abatement Act, ought to be ever-present to our commercial classes; and, even more seriously than in the case of the Railway Directors' Association Bill, this tale ought to demonstrate the necessity for the establishment of some Association whose object should be to perform, for the interests of trade, the functions discharged by the Remembrancer of the City of London for his clients.

Eastern Counties Gas Managers' Association.—The half-yearly meeting of the Association is to take place at Colchester, on Wednesday, April 21, under the presidency of Mr. W. W. Townsend, who will deliver his address. There will also be a paper by Mr. A. W. Sumner, of Grays, on "Distribution of Gas to Outlying Villages." The meeting will be preceded by lunch at the Red Lion Hotel, on the invitation of the Directors of the Colchester Gas Company. There will be a dinner at the hotel in the evening; and arrangements are to be made for visits on the following morning to the gas-works and to places of historical interest at Colchester.

SOUTHERN ASSOCIATION OF GAS ENGINEERS AND MANAGERS.

The Annual General Meeting of the Association was held last Tuesday, at the Connaught Rooms, Great Queen Street, W.C.—partly under the chairmanship of the retiring President (Mr. Frank Livesey, of Maidstone), but in the main with Mr. C. F. Botley of Hastings, the new President, in the chair. There were about 120 members and guests present. The new Hon. Secretary (Mr. W. H. Bennett, of Redhill), quietly testified by the completeness of his arrangements that he was the master of the duties of the office. Among those whom the members had the pleasure of welcoming were Dr. G. G. Gray, the Chairman of the Hastings and St. Leonards Gas Company, and Mr. E. R. Mansell and Mr. A. M. Apel, members of the Board of the Company. Instead of the annual dinner, the members had luncheon together preceding the meeting, with the President-Elect (Mr. Botley) in the chair.

After luncheon, the loyal toast was honoured.

Mr. J. Wesley Whimster (Bath) proposed "The Health of the Visitors," coupling with the toast the name of Dr. Gray, the Chairman of the Hastings and St. Leonards Gas Company. The members of the Association were always delighted to have visitors at their gatherings; and they were glad to see so many present that day. Especially pleased were they to see their worthy President-Elect supported so well by his Board. The members of the Hastings Gas Company's Board were not altogether strangers to members of the Association, because a great many of them well remembered their visit to Hastings some years ago when the Institution of Gas Engineers went to the Company's new works at Glyne Gap, and had extended to them great hospitality on the part of the Company. He would like to mention among the visitors the members who were present from other Associations, as well as the representatives of the Technical Press, to whom the gas industry is much indebted.

Dr. Gray, in responding on behalf of himself and his colleagues and all other visitors, thanked the members of the Association for the opportunity they had given them to be present. Being neither gas engineers nor managers, they had no title to be there, other than by the kind invitation of the members. He thanked them for this, for the way they had entertained them, and for the manner in which they had drunk their health. He was sorry that all his fellow-Directors had not been able to come to town; but they were men who were kept busily engaged. He should have been personally sorry not to have been present on this occasion, when his old friend Mr. Botley was becoming the President of the Association; for his fellow-Directors esteemed it, and it was, very gratifying to themselves, that the Association should have come to them on this occasion for their President. He (Dr. Gray) had known Mr. Botley—he could not say whether for more years than the members of the Association had; but anyway it was some thirty-five years ago that, as a new-comer to the Board, he considered he did a very good thing for the Company and the town when he went over some seventy applications for the post of Engineer and Manager, and from them selected a few, and then submitted the recommendation (which was adopted by the Board) that Mr. Botley, the father of the President, should be appointed their Engineer and Manager. He (Dr. Gray) had never regretted this action. On the contrary, he always considered, by this one act alone, he deserved all that he ever got from the Board. But this was not all. Not so many years ago as thirty-five, but a good portion of those years, Mr. Botley started to assist his father; and naturally on occasion he practically took control of the works until his father passed away. Having been the Assistant Manager for a number of years, he then assumed the whole weight of responsibility for the management of the undertaking. So to the first indebtedness, he (Dr. Gray) had added a second indebtedness. As Mr. Whimster had kindly said, he (Dr. Gray) was not quite a stranger to the members, nor were his co-Directors, though one or two might be so more or less. They hoped, however, that during the year of office of the President—and the earlier the better on account of the weather—they would renew the acquaintance of the members at Hastings. To those of the members who did not know Hastings, he could say that it was a very pleasant place to stop in, and some of them had the impression, and had staked their lives upon it, that it was not a bad place to live in. Regarding what they as a Company had to show, he had not the slightest doubt that those of the members who favoured them with their presence at Hastings would find Mr. Botley could show something that would interest them. They were a Company existing under peculiar conditions; and, when they visited Hastings, the members might also hear something as to this peculiar situation. He thanked them for the manner in which they had drunk the health of the visitors.

Mr. H. E. Bloor (President of the North of England Gas Managers' Association) said he had been asked to propose the toast of the "Southern Association of Gas Engineers and Managers," coupled with the name of the President-elect (Mr. Botley). The Southern Association had done very good work for the industry; and he (Mr. Bloor) was sure that all the visitors present would wish the very best of luck and success to the future efforts of the Association. As regarded the President-elect, he had succeeded to a tradition. He supposed there was no gas office in the world into which they could go, and mention the name of "Botley," without hearing "of Hastings," added to it. "Botley, of Hastings," was a tradition in the gas industry. It was no small responsibility to succeed to a tradition like that; but all present would agree with him that the President-elect nobly sustained the responsibility.

Mr. Botley, replying on behalf of the members, thanked the visitors for their kind expressions towards the Association. He trusted they would continue to deserve these good things and opinions. He thought perhaps the Southern Association had a good opinion of themselves. They had anyway been very fortunate in having many distinguished men to occupy the post to which they had had the honour of electing him. Some of the members might not have realized it, but he, being President-elect, was a little bit in front of his time in presiding at the luncheon. His friend, Mr. Frank Livesey, was still President; but by the new arrangement of having a luncheon instead of a dinner, it became necessary to put the cart before the horse. He thanked Mr. Bloor for his kind personal references, and especially for the allusion to his dear father who established the "Botley tradition." He was very fortunate indeed in having such a father. The name his father held in the profession had not only been a great help to him personally, but it had been a great advantage to the Hastings and St. Leonards Gas Company. It was now some seven years ago since his father was last at a function in one of the rooms of the building in which they were then meeting. It was always a great pleasure to hear references to his honoured name; and for that reason if for no other, he thanked the members most heartily for the acceptance of the toast to which it was his duty to respond.

BUSINESS MEETING.

The Business Meeting was held a little later in an adjoining room. During the more or less formal business, the retiring President (Mr. Frank Livesey, of Maidstone) presided.

Minutes Confirmed.

The President submitted the minutes of the last meeting, as published in the "Journal." He proposed that the usual course be taken of confirming without reading them.

This was agreed to.

Annual Report.

The President proposed that the annual report as circulated among the members be taken as read. He had no remarks to make about it, except that, like all other Associations, they were feeling in every respect the rise in costs. This was not to be wondered at. This year for the first time they were not going to distribute among the members the bound copies of the Transactions of District Associations. This had been settled by the Committee; and it would enable the Association to keep financially in a satisfactory state.

The report (which was passed) pointed out that during the year progress had not only been maintained, but there had been advance in every direction. The report showed that the year had been a very full one. Under the heading "Membership and Finance," the Committee reported as follows: Substantial progress has been made during the year under review so far as membership is concerned—twenty-six names having been added to the roll. The Association may well be proud of such a record; but it is a matter for deep regret that the Committee have to record the death of the following four members: Mr. A. Dougall, of Tunbridge Wells; Mr. W. Parker, of Ryde (I. of W.); Mr. W. J. Carpenter, of Great Yarmouth; and Mr. T. May, of Richmond. There have been twelve resignations and two members have become disqualified. This leaves a total of 241 members, compared with 233 at the end of 1918. The financial condition continues satisfactory. The receipts of the year amounted to a total of £162 15s. 9d., while the expenditure was £164 12s. 10d.—showing a small deficit of £1 17s. 1d. It must, however, be remembered that several large bills have been met, including one of £80 for printing. There are now no outstanding accounts against the Association. The £50 War Loan has been sold and the amount realized—amounting to £45 8s. 3d.—credited in the January account, 1920.

Slight Additions to Rules.

The President said there were one or two small alterations that the Committee wished to have made to the rules. They had entirely reorganized the rules; and as often happened on these occasions, they found some further little changes were necessary. He would ask the Hon. Secretary to explain the position.

The Hon. Secretary (Mr. W. H. Bennett) said it would be remembered that at the November meeting Mr. Head pointed out that it would be advisable if they had District Secretaries *ex-officio* on the General Committee of the Association, and the President, Vice-President, and Honorary Secretary of the Association members *ex-officio* of the District Committees. But the Committee were unable to put these changes in the rules without the sanction of the members.

The President proposed in regard to Rule 7—"That after the words 'Honorary Treasurer' should be added 'the District Secretaries *ex-officio*.'" In respect of Rule 9, "That the following words should be added: 'The President, Vice-President, and Honorary Secretary of the Association shall be members *ex-officio* of the District Committees.'"

Mr. H. C. Head seconded the motion, which was unanimously carried.

The rules affected now read—

Rule 7. The management of the Association shall be vested in a General Committee consisting of the President, Vice-President,

the last three Past-Presidents, an Honorary Secretary, an Honorary Treasurer, the District Secretaries *ex-officio*, and District Representatives to be elected for a period of three years (one-third to retire annually) by the members in their respective districts. Five to form a quorum.

RULE 9. The members in each district shall appoint annually at the meeting mentioned in Rule 8 a Chairman, Vice-Chairman, Honorary Secretary, and Committee for the district; and they shall take office in March of each year for the ensuing twelve months. The President, Vice-President, and Honorary Secretary of the Association shall be members *ex officio* of the District Committees.

A NEW AUDITOR.

The HON. SECRETARY said in anticipation of the passing of this rule, the Eastern District at their last meeting, elected Mr. W. E. Price as *ex-officio* member in place of Mr. Tobey who was elected to the General Committee by the Eastern District. Mr. Price was one of the Auditors, so that it would be necessary for a new Auditor to be elected.

Mr. C. VALON BENNETT (Rochester) proposed, and Mr. W. DOIG GIBB (London) seconded, the election as an Honorary Auditor of Mr. John Urquhart, of Dorking.

ELECTION OF NEW MEMBERS.

The HON. SECRETARY read the following names of gentlemen who had been proposed for membership: Mr. J. Lothian Anderson, of Beckton; Mr. W. Lewis Copp, of Axminster; Mr. Valentine Corfield, of Brighton; Mr. Clarence Dunn, of Blandford; Mr. G. Foster Dunn, of Wells, Somerset; Mr. David E. Garlick, of Glastonbury; Mr. John R. Hale Jacobs, of Southampton; Mr. Edgar H. Martin, of Harpenden; Mr. Herbert Moys, of Bromley-by-Bow; Mr. David Muir, of Pontypridd; Mr. Richard S. Ramsden, of Leamington; Mr. Harold M. Royle, of Kensal Green; Mr. John Sheridan, of Stratford, E.; Mr. Herbert A. Stibbs, of Portsmouth; Mr. J. H. Thomas, of East Greenwich; Mr. W. H. Warren, of Beckton; Mr. A. J. S. White, of Chard; and Mr. H. J. White, of Honiton.

The PRESIDENT said it was a very satisfactory thing to record they had no less than eighteen new members. He thought there was no doubt this was greatly due to the new rules that had been brought into force, and the new benefits it was hoped to confer on members by holding monthly commercial meetings in the two parts of the South of England. He proposed the election of the new members.

Mr. W. N. WESTLAKE (Exeter) seconded the motion, which was heartily agreed to.

TWO NEW HON. MEMBERS.

The PRESIDENT said the next item was of special importance. The Committee had received that morning with great regret the resignation of Mr. Harold W. Woodall, of Bournemouth. He (the President) had very much pleasure in moving his election as an honorary member of the Association. He should like to recall to the minds of the members part of Rule 2, which gave the Committee power to recommend for honorary membership anyone whose qualifications might be of advantage to the Association. The members would unanimously agree with him that it would be a very serious blow to the Association if they lost the membership of their good friend, Mr. Woodall. At the same time he had to bring forward with great confidence another name for election as honorary member—that of Sir Arthur Duckham. The members would all agree with him that they were very fortunate indeed if they were able to retain these two gentlemen as honorary members. It would be of great benefit in the future.

Mr. H. C. HEAD said he laid it down in Committee that morning that he must have the privilege of seconding this proposal. It had, of course, to come from the chair. But the proposal that his old chief should be elected an honorary member must have a word from him (Mr. Head). He also felt he should have a word as to Sir Arthur Duckham, who was quite a big man now; and he (Mr. Head) was quite a little one. When he (Mr. Head) was a big boy, Sir Arthur was a little one. He (Mr. Head) had known him longer than anyone else in the gas industry, seeing that when a boy Sir Arthur was handed over to him as a senior student. For these reasons primarily, and secondly because they were worthy, he had great pleasure in seconding the proposition.

The motion was heartily carried.

PRESENTATION TO THE LATE HON. SECRETARY.

The PRESIDENT said the next item on the *agenda* was one that called for more eloquent words than he could give expression to. When he became the President of the Association, he knew that the President did depend very largely on the efforts of the Hon. Secretary; but it was not until he actually came into the chair that he realized the amount of work that Mr. Head as Hon. Secretary had to do, and had done for many years past, for the Association. He had been their valued Hon. Secretary since 1913; and he had never spared himself, nor had spared efforts, to promote the welfare of the Association, and to increase the membership; and the popularity of the meetings were largely due to his untiring endeavours. Therefore, when the Committee suggested that it was only right Mr. Head should receive some token of the members' deep esteem and appreciation of his personal character and the great work he had done, the members would not be surprised to learn that the suggestion met with general approval. He felt that, when a presentation was made, it was much the best plan to give the recipient something which was actually of some good to him. They all knew how silver or silvered things did accumulate; and so the Committee took the wise step of asking Mr. Head what he would like. His estimate of Mr. Head had risen since his choice fell upon a gun. He did not think he could have made a wiser choice. He would ask Mr. Head to receive the gun from the members as a small expression of their recognition of what he had done for the Association. He (the President) was sure the members would all wish him many years of strength and activity to enjoy the use of the gun. [Applause.]

Mr. HEAD, on rising to respond, was received by further applause. He said he was quite at a loss to know what to say to his fellow-members. Remarks on such an occasion should contain two great qualities: First of all, they should be sincere; and, secondly, they should be properly expressed. As to the first they might take his word for it that there was no doubt as to his sincerity. As to the second, he would ask the members to accept his excuses for not being able to find words adequate to express his thanks. The President in his kind remarks had made one great mistake. He said he (Mr. Head) selected the present. He did not. His wife did. It was referred to her to ascertain what he would like; and she said—and he thought truly—that whenever he was seeking relaxation he was never so happy as when he had a gun in his hand. That settled it. If he had done anything to deserve the presentation, he was only too glad. Work for the Southern Association had always been a great pleasure. If it had been any success, it had been through the unanimous help and good feeling that came from and ran through the whole Association rather than from the efforts of any one individual. No official could alone make an Association a real success. He could only express the thoughts and the actions of his Committee and of all the members individually. Having had experience, and knowing practically every member, he could assure them of the whole-heartedness the members had for the interests of the Association; and this was clearly for the good of the industry as a whole. It was the action of the Southern Association that led to the British Commercial Gas Association, and later on to the National Gas Council starting. Both organizations had been of immense advantage to the industry as a whole, and to the members as employees. When the members accepted his resignation last November, he had no idea they were going to be so generous to him. That he was pleased—more than pleased—must not go without saying; but they would appreciate this without any enlargement of words. They had given him with their good wishes a gun, which he hoped would accompany him for many hours of leisure in times to come. It would be a very great pleasure to him when he used it, because it was given to him by the very best friends he had ever had in his life—friends he had been associated with all his life, and whose friendship was very important to him. He hoped they would accept his assurance of his goodwill to the Association, and his promise that, if opportunity offered, and there was anything he could do for the Association at any time, he should be only too happy to do it.

REPRESENTATIVE ON THE INSTITUTION COUNCIL.

The PRESIDENT proposed and Mr. L. J. LANGFORD (Tunbridge Wells) seconded, the appointment of Mr. Botley as representative of the Association for this year on the Council of the Institution of Gas Engineers.

The motion was unanimously carried.

THE NEW AND RETIRING PRESIDENTS.

The PRESIDENT said his next duty was to vacate the chair, and to ask their good friend Mr. C. F. Botley to assume the responsibilities of the office. He had known Mr. Botley as long as he (Mr. Livesey) had been in the gas business; and so he could say, with confidence, that in their new President they would have one who would carry forward the work to a greater height than it had yet reached. Mr. Botley bore an honoured name in the gas industry; and his services had always been at the disposal of the Association and kindred organizations. Those who had collaborated with him had realized he was a man of great driving power; and this was a very important essential in these times. He had much pleasure in asking Mr. Botley to take the chair.

Mr. BOTLEY took the chair, amid the applause of the members.

The PRESIDENT said he was afraid a task had been set for him which he almost feared to essay, if he was to rise to heights higher than had his many predecessors in the office which he had now the honour to enter upon. Indeed, he thought this was something which would dismay a more competent member of the industry than himself. However, it had been a great pleasure to him to be elected President of such an Association; and what he could do, he should do, without fear or favour, on behalf not only of the Association, but of the gas industry. His first duty was to move, on behalf of the members, a hearty vote of thanks to the gentleman, also of honoured name, who had just vacated the chair. It was his (Mr. Botley's) misfortune not to participate in the meeting in March last, nor the visit to Maidstone, nor that (which undoubtedly arose from the connection with the name of Livesey) to the Old Kent Road works of the South Metropolitan Gas Company, where Mr. Livesey's father officiated for so many years. Those of them who had had an opportunity of walking the presidential year with Mr. Livesey knew he was perfectly sincere when he (the President) said that he had carried on the office with distinction, and in a way which they would expect from anyone bearing the name of Livesey. They were indebted to him for what he had done. As President of the Association, he had had many calls which they did not see in print, or might not know

of. Mr. Livesey was a member of an important Committee dealing with the standardization of gas-cookers, of which subject he had special knowledge. He had also been assisting the Committee of the Institution of Gas Engineers dealing with recording calorimeters; and in many other ways he had been doing useful work. He was a credit to the gas industry in Maidstone; and a credit to the gas profession in all places. He was an able administrator and engineer to his Company. He (the President) proposed a vote of thanks to him for his conduct in the chair during the past year.

The motion was carried with applause.

Mr. LIVESEY thanked the members most heartily for the kind vote of thanks they had passed to him on retiring from the presidency. When he entered upon the duties a year ago, he felt like a sheep going to the slaughter; and now he felt, looking back over the year, that—he would not say he had done many things he ought not to have done, but there were many things that he had left undone which he ought to have done. Any work he had been able to do had been a great pleasure to him. He felt very strongly that he was indebted to Dr. Carpenter, who gave them an extra meeting, and one of the most interesting visits it had been his (Mr. Livesey's) lot to experience. Favoured by Dr. Carpenter's help, he trusted the year had not been an unsuccessful one.

The PRESIDENT then read the following

INAUGURAL ADDRESS.

Gentlemen,—In thanking you for the honour you have done me by electing me as President I cannot but recall the fact that my father, who was one of the original members of the Association, occupied the presidential chair in 1884. It is also a coincidence that, whereas he was succeeded by the late Mr. George Livesey (as he was then), I succeed Mr. Frank Livesey.

I take the following extract from the Presidential Address of 1884:

> Founded in the year 1875, by the earnest endeavours of a few among the present members, the Association has grown year by year, gaining in importance and utility, fostered by the constant care of its founders, and strengthened by the support of some of the most eminent men in the profession, until at the present moment it maintains a position second to none.

I think I can claim that what was true then is, after an expiration of thirty-five years, more than confirmed, and that our Association has performed, and continues to perform, most valuable services on behalf of the gas industry. Certainly, speaking personally (and I acknowledge it with gratitude), I have received most valuable assistance and co-operation from my membership of the Southern Association to the advantage of my Company.

Looking back through the "Transactions" of the Association for the last generation is both useful and instructive; and I commend the study to our younger members.

War-time worries and difficulties caused us to seek closer co-operation for mutual support; and thus the frequent meetings of the Commercial Sections of our Association (held chiefly in London and Exeter) were greatly appreciated, and discussions at the meetings frequently arose on technical as well as commercial subjects. In a considerable number of undertakings, too, the engineer and manager responsible for the manufacture and the maintenance of the plant has also to deal with commercial problems; and indeed many of these problems cannot be dealt with unless both the manufacturing and the commercial sides are regarded. Consideration of the facts just mentioned led up to the question of the re-constitution of the Association; and this, as you know, has now taken practical shape.

It is convenient to divide the Association's area into Eastern (London) and Western (Exeter) Districts, with separate Committees and officers. The qualifications for membership remain the same; but meetings are open for the discussion of any question of interest, and commercial intelligence is circulated, which is strictly reciprocal and confidential.

The first period of the new re-organization or re-constitution is a little abnormal; for it will be rather more than a year. However, following March, 1921, the course of events should be normal; and so far as I have observed as Chairman of the Eastern District, the changes are appreciated. I might refer to a rule which provides for the presence at the meetings of non-members under certain conditions, as it may obviate cases of difficulty.

Our own Association as you know is affiliated to the Institution of Gas Engineers—our premier body, although perhaps a little bit eclipsed by other organizations in these times of extreme difficulties and conditions. I hope we shall not overlook the work which has been and is being accomplished by the British Commercial Gas Association and the Gas Companies' Protection Association. There is, of course, such a thing as too much organization; but I speak with some knowledge when I say that the bodies I have just mentioned have special spheres of work of usefulness in our industry. I commend also to your notice the active work of the Junior Association in our area. Between all the Associations and the National Gas Council, as re-constituted, there must be close co-operation, and a thorough understanding. On questions which concern every gas undertaking the National Gas Council is the voice and guide of the industry; and for this reason I would like to see all undertakings—statutory or non-statutory companies as well as municipal—belong. I do not, however, think we should expect the Council to relieve us of individual responsibility, or save us trouble in solving our own problems; and there are matters which, as is frequently done, should be referred to more suitable competent bodies to deal with.

In our industry, the fundamental operation of the destructive distillation of coal and the distribution of the resultant gas can be carried out in so many different ways, under such different local conditions and with such varying staffs that there are very few questions indeed which can be decided on one basis; and even then there is the danger of a decision being unconsciously influenced by the very large undertakings, which is unfortunate when it is remembered how small these are numerically compared with the bulk. There is also the danger of the Council, which cannot be truly representative for the reasons I have indicated, being the avenue of approach or of attack for the industry.

History warns us of the aftermath of war; and, after such an upheaval, we naturally expected industrial difficulties. But who of us at this time subsequent to the armistice could have anticipated that coal for instance would be worse in quality, more difficult to obtain, and more costly than during the days of war? I share the belief in the good sense of my fellow-countrymen and in the wonderful resource and stability of our nation (who with a knowledge of war-work can doubt it?); but I must confess I view with concern the road we have to travel in the near future. There is a disquieting absence of finality. Decisions or standards set up to-day are abrogated or ignored to-morrow. In such circumstances, business is generally held-up and development impracticable. Our manufacturers accept orders only on the condition that the goods shall be invoiced at the prices and terms ruling at the date of their despatch, which may mean anything. An estimate will only be accepted with protection clauses, so that something undertaken may eventually cost double that anticipated. Have the Government any real plan? Is it the intention to set up a new standard, so that the shilling of 1914 is the equivalent value of the sixpence of 1920? If so, then it is only a question of time for the pre-war relative position to be re-established, and few if any will be better off; but in the transition period many will be ruined while the few will be in affluence. If 5 p.ct. was considered a reasonable return for gas investments in pre-war days, surely to be consistent something like 7 p.ct. would be reasonable nowadays; and it has to be remembered that those who by the accident of war have benefited financially, not only have had an adequate income to meet the increased cost of living, but have been enabled to invest any surplus at the higher rates of interest now prevailing in Government and industrial securities, with further revenue to themselves.

Apart from higher costs, we are all experiencing trouble and delay in getting material for the repair or extension of plant; and I believe this is largely due (as recently indicated by a cabinet minister) to the reduced working hours granted—not, be it remembered, by mutual concession or after consideration of national interests, but under threat of strikes—to railwaymen and transport workers. In time, these changes may doubtless right themselves; but it is certain that the premature granting of them must delay our return to more settled conditions of general prosperity.

It is recognized that in pre-war days employment afforded by the gas industry was satisfactory. Obviously it was so, because we attracted to the service the best of men. Unfortunately (but perhaps it is not to be wondered at), the industrial turmoil and unrest have disturbed our ranks and many of our employees now have to subscribe to doctrines and schemes of which I for one believe the majority cordially disapprove. This new system is a poor substitute for the splendid co-operation and comradeship which used to exist, and which I hope in spite of all is gradually being restored.

One unsatisfactory feature of more recent awards is the entire absence of any reference to the obligations with higher wages of continued efficiency and output on the part of those who benefit—I do not of course in any way refer to the economic adjustment of wages. This is I am sure one of the more serious aspects of industrial trouble. [Since these words were written, an award has been given in connection with the engineering trades not of the stereotyped form, which has taken other factors than the cost of living into account; but so far as I have noted, the award has not been granted with any actual condition of increased production.] High wages are not the panacea for every ill, and will not give happiness, much less contentment—in fact, they are to some extent responsible for the present high food prices.

Reference has been made to these matters for a definite reason. At present, we do not appear to have a Government properly so-called—in other words the Government only act from pressure, or threat, or force of public opinion. In regard to the last, each can in his own environment help, I am confident, to put forward facts and move public opinion in the national interests. I urge, therefore, that we should have the courage of our convictions; and when we think or know something to be wrong and opposed to the general interests, to make a stand against it rather than (because it is easier) run with the popular tide of acquiescence.

We are promised a new charter, which may be considered in two aspects—financial and technical. As regards the first, justice is long in coming, and the reward of our war work such as to make many say, "Patriotism does not pay." It is indeed surprising to find the general public expecting—indeed, insistent upon—the maintenance of gas supply, and yet content to stand

GLYNE GAS-WORKS.—ANALYSIS OF WAGES.

Description.	Half Year ended June 30, 1913. Total.	Per 1000 C.Ft. of Mixed Gas Made.	Two Weeks ended Jan. 9, 1920. Total.	Per 1000 C.Ft. of Mixed Gas Made.
	£ s. d.		£ s. d.	
COAL.				
Unloading into bunkers for use	95 7 1		40 2 5	
Attending and oiling machinery	10 9		..	
Unloading to stock	13 6 4		19 15 4	
Breaking and placing cannel	..		..	
Wheeling from stock	35 12 2		1 9 8	
	144 16 4	0·15d.	61 7 5	0·68d.
MANUFACTURE—RETORT HOUSE.				
Foremen	112 7 9		16 18 8	
Stage-floor men	288 16 0		46 8 10	
Attending hydraulic mains	34 12 9		5 0	
Firemen (includes clearing clinkers)	..		4 9 6	
Pipe-cleaning	..		1 10 7	
Odd men	80 9 2		25 0 9	
Scurfing and slow firing	12 11 2		7 14 8	
Special cleaning-up	..		..	
Coke men	32 7 2		..	
	561 4 0	0·57d.	102 8 0	1·13d.
C.W.G. PLANT.				
Unloading oil	1 15 8		2 5	
Operators	70 9 9		15 17 3	
Coke men	49 7 4		16 6 7	
Stocking coke	5 0		3 7	
Removing clinkers	..		..	
Pumping and separating tar	9 6		1 10	
Clinkering men	24 7 10		16 17 6	
Odd men	8 4		..	
Special cleaning-up	2 18 3		4 9	
	150 1 8	0·15d.	49 13 11	0·55d.
MACHINERY HOUSE.				
Fitter drivers	96 14 1		22 13 7	
Assistants	23 19 7		2 7	
	120 13 8	0·12d.	22 16 2	0·25d.
BOILER HOUSE.				
Firemen	87 2 3		24 6 8	
Assistants	39 14 8		3 8 8	
	126 16 11	0·13d.	27 15 4	0·31d.
COKE.				
Dock men	175 16 4		72 8 3	
Yard and loading	44 18 11		17 2 4	
Breaking and loading	37 0 11		..	
	257 16 2	0·26d.	89 10 7	0·99d.
RESIDUALS (other than coke).				
BREEZE.				
Screening, loading, &c.	8 4 6	0·01d.	11 11 9	0·12d.
TAR.				
Pumping and attending	3 16 3		11 1	
Loading	5 3 5		16 7	
	8 19 8	0·01d.	1 7 8	0·02d.
LIQUOR.				
Production	3 9 11		13 11	
Working-up	35 11 0		6 13 8	
Loading	1 4 2		4 7	
	40 5 1	0·04d.	7 12 2	0·08d.
CLINKERS.				
Picking and clearing away, &c.	88 5 0	0·09d.	14 17 2	0·18d.
CARBON AND CLINKERS	1 14 11	0·002d.	..	..
PURIFICATION.				
Unloading material	2 0 10		..	
Preparing	30 11 3		1 7 11	
Loading material spent	4 0 0		..	
Changing purifiers	21 0 9		11 13 10	
	57 12 10	0·06d.	13 1 9	0·15d.
R. & M. (repairs and renewals).				
Retort-house machines (includes air-compressors, &c.)	33 5 8		8 3 2	
Land, buildings, residences	60 1 11		3 8 0	
Retort-beds and boiler settings	120 14 6		16 8 11	
Retort-house fittings, carbonizing plant	134 10 10		19 12 1	
Coal plant	19 5 11		1 1 9	
Coke plant	65 15 3		6 17 3	
Hydraulic plant	25 10 5		7 1 3	
Electrical plant	18 14 2		5 3 3	
Boilers, steam and exhaust pipes	62 8 11		3 3 7	
Tar and liquor plant	19 18 10		6 1	
Purifiers	12 5 9		..	
Machinery house plant (excludes air-compressors)	25 16 7		4 12 6	
Gas supply, lighting	3 18 2		..	
,, ,, power	..		..	
Water supply, attending	27 2 6		2 14 10	
,, ,, pumping	..		..	
Carried forward	£629 9 5	1·59d.	£78 12 8	4·46d.

Description.	Half Year ended June 30, 1913. Total.	Per 1000 C.Ft. of Mixed Gas Made.	Two Weeks ended Jan. 9, 1920. Total.	Per 1000 C.Ft. of Mixed Gas Made.
	£ s. d.		£ s. d.	
Brought forward	629 9 5	1·59d.	£78 12 8	4·46d.
R. & M. (repairs and renewals)—*Continued.*				
Cleaning-up	36 0 0		7 8 10	
Drainage	2 9 7		1 12 2	
C.W.G. plant (includes plant in machinery house)	44 4 1		2 17 3	
C.W.G. plant generators	..		1 2	
Railway wagons	10 1 0		9 5 5	
Roads, sidings, and yard tramways	6 11 3		7 9	
	728 15 4	0·74d.	100 5 3	1·12d.
Out-station work, Queen's Road, M. & S., &c.	7 1 4	0·01d.	1 13 10	0·02d.
Outside work per Fitting Department	24 12 8	0·02d.	..	..
Sundries	44 9 10	0·04d.	4 8 2	0·05d.
SHUNTING	67 6 9	0·07d.	15 11 8	0·17d.
SYPHONS	22 6 10	0·02d.	4 3 7	0·05d.
OFFICES	107 9 4	0·11d.	12 9 7	0·15d.
STABLES	..		..	
LABORATORY	..		1 5 3	0·01d.
ACCIDENT AND SICK PAY	..		..	
HOLIDAY PAY	41 3 6	0·04d.	..	
CONSTRUCTION—Additions or improvements	42 4 4	0·04d.	7 0 6	0·08d.
	£2652 0 8	2·68d.	£548 9 9	6·11d.

	Half Year ended June 30, 1913.	Two Weeks ended Jan. 9, 1920.
Coal (actual) carbonized	14,445 tons	1,674 tons
Oil used	178,506 gallons	7,613 gallons
Gas made, total	236,816,000 c.ft.	21,561,000 c.ft.
Coal gas	172,078,000 ,,	15,878,000 ,,
C.W.G.	64,738,000 ,,	5,683,000 ,,

This analysis, comparing the first half year of 1913 with two weeks of the present half year, indicates the effect of the changes in regard to wages and hours of employment. For the sake of simplicity all the figures per 1000 c.ft. of gas made are taken on the total or mixed gas.

by and see such undertakings in desperate financial straits. To us the principles of the sliding-scale or maximum dividend appear and seem simple in the extreme; but to others—and especially members of Parliament—they are evidently past understanding, or is it that there is no desire to understand?

Compared with the increased cost of labour or coal the additional amount required to pay equitable dividends or interest on capital invested, as represented in pence per thousand cubic feet of gas sold, is trivial. Belated or not, however, something must be done if money is to be raised for extensions and improvements; and it is especially in the interest of consumers to raise money cheaply. Therefore, Parliament has a clear duty, and especially in view of the Government patronage of electricity schemes which may be to many a snare and a delusion.

As to the technical side, which more especially interests us here, and is briefly the selling of gas on a heat instead of an illuminating power standard or basis, there is perhaps a tendency to regard gas as a fuel only, and therefore I would urge that the value of gas as a lighting agent should not be minimized or overlooked. In any case the lighting-load must be adversely affected by changed conditions such as summertime, reduced shopping hours, and reduced working hours.

Electricity, as you know, is being offered at very low rates for heating purposes; and, in connection with the London companies, this statement was recently made: "A point of considerable interest and importance is the constantly growing demand for power for heating purposes." It will surely become a question of considerable importance, having regard to the conservation of coal, as to how far current for heating purposes should be offered at such low rates—thus encouraging an extravagant use of fuel.

In the new housing schemes, the All-Gas House is of particular importance; for since gas will generally be needed for cooking and heating, the lighting is easy and very economical as compared with a separate electricity supply, which for lighting cannot very well be a commonsense proposition however pleasing or tempting to municipalities owning electricity works. I naturally have in mind incandescent gas lighting, which is brilliant without glare, also comfortable and hygienic. I am not an advocate of non-luminous gas, for I consider the much reduced need of flat-flame burners adequately met by gas of 11 to 12 candle power (No. 2 Metropolitan burner).

One definite lesson of the war was the extravagance or uselessness of the old standards. It is mentioned simply for what it is worth that our experience in the supply of coal gas and carburetted (or blue) water gas during the last year or so has led me,

GLYNE GAP WORKS LABORATORY.—BOILING TESTS.

Kind of Gas.	Amount Used C.Ft.	Temperature of Water at Start.	Time taken to Reach Boiling Point.		Size of Flame.	Gross Calorific Value of Gas B.Th.U. per C.Ft.	Rise in Temperature per C.Ft. of Gas Used.	B.Th.U. Used.	B.Th.U. Absorbed by Water.		Remarks.
		P.Ct.	Mins.	Secs.					Number.	Per Cent.	
Coal .	1·81	15	15	29	Just touching base of kettle	442	46·9	800	212·5	26·6	2 pints of water used in each case. 1⅛ in. from bottom of kettle to centre of holes in boiling-ring. Flames adjusted to just show a distinct inner cone.
,,	1·73	14·5	15	46	Ditto	470	49·4	813	213·75	26·3	
,,	1·80	13	6	55	Just reaching edge of base	470	48·3	846	217·5	25·7	
,,	1·81	19	12	2	Just touching base	414	44·8	749	202·5	27·0	
,,	1·89	17	12	17	Ditto	417	43·9	788	207·5	26·3	
,,	1·99	17	6	3	Just reaching edge of base	417	41·7	830	207·5	25·0	
C.W..	1·36	19	12	42	Just touching base	555	59·6	755	202·5	26·8	
,,	1·71	17	14	9	Ditto	460	48·5	787	207·5	26·4	
Mixed	1·74	18	18	17	Ditto	470	47·1	818	205·0	25·1	

The above tests were made [by F. J. Winter] from the consumers' point of view. An ordinary tin kettle and boiling ring were used. The latter had the usual tap, and also an air-adjuster, which was regulated when required. The results are interesting, particularly as showing the wide range of practicability of gas supply.

both as consumer and producer, to regard a gas of 470 B.Th.U. quality (gross), as most satisfactory and advantageous. Uniform composition and pressure as far as practicable are obviously essential. There has been some general agreement with the Beilby report; and I therefore offer these remarks with some diffidence. I cannot help feeling that the terms of the report were much influenced by extreme conditions resulting from the war, and that the introduction of a dual standard again, with penalty clauses (I refer to the restriction of inerts in addition to the calorific value) is unfortunate. Do not misunderstand me. I have no sympathy or defence for the careless or deliberate adulteration (in manufacture) of gas with inerts. But, on the other hand, I should much object to being fined (at the instance of the Electricity Committee of the Corporation in my own case) because with a calorific value over the prescribed standard, the inerts were (say) ¼ p.ct. in excess of that allowed; and my experience tells me that such a contingency is possible. Besides, why should the coal carbonizers be placed in such position when more often than not there is no control over the coal supplied?

I am of opinion that in this matter of inerts we could very well have been trusted, for with a prescribed calorific standard to work to, there will be a recording instrument to check us, and is it reasonable that as common-sense men we shall deliberately be careless and not sell gas on the most advantageous thermal basis? Inerts, in a word, will not pay; but whether restriction of them to academic limits will be advisable is another matter. It is quite conceivable that so much expense might be incurred in the matter as to be disadvantageous to the consumers who would, for a refinement, be paying out of all proportion to the actual practical benefit.

There is one other aspect of inerts to which I object, because it will cause invidious distinction and standards. It is obvious that only some undertakings will be subject to tests for both calorifics and inerts. It behoves all to look ahead, and consider the plant most suitable for these new conditions. Will the best solution be found with straight coal gas, with coal gas and carburetted water gas, or with vertical retorts and steaming? We shall all be watching with great interest the various schemes for the complete gasification of coal. Gratifying results are, indeed, already reported.

At our November meeting, Colonel Woodall called attention to some remarkable facts in regard to coal in vertical retorts. An otherwise poor gas coal when steamed gave splendid and quite unexpected results. This opens up a useful field of authoritative investigation.

Coal, of which there are not unlimited supplies in this country, is at once the life-blood of our business and the foundation of the nation's prosperity. Conservation of coal should, therefore, be of primary importance; but in dealing with the problem political exigencies appear to chiefly count. In spite of our worries and exasperations, it is impossible not to feel sympathy with the Coal Controller and his staff in their endeavours to make the best of a bad job. Stocks of coal are perilously low; but yet, despite muddle and expense, very few gas-works, comparatively speaking, have had to shut-down for actual want of coal. We have had to get accustomed to having on hand a few days' supply instead of three months'. South Coast undertakings have been subjected (whatever the cause) to invidious treatment. My own case is typical. On the outbreak of war our port (Newhaven) was closed, and subsequent supplies had to be obtained partly from Yorkshire and partly from Durham by sea to London and then by rail. Now with little or no Yorkshire coal, we have to take Durham *vid* Newhaven—the most expensive route. The cost of carrying coal from Durham to our works at Glyne Gap in 1914 was 7s. 7d. per ton. We now have to pay up to 30s. 3d. Coal on board in the Tyne is now up to 32s., against a pre-war price of 12s. The cause of part of the increased cost is obvious. Miners' wages have greatly increased (6s. 5d. to 14s. per day was a recent official figure), with a shorter working shift. The output per man employed in the mines has seriously decreased.

There is now a further demand from the miners, which appears without justification and extremely selfish. If granted, it appears that it would increase the cost of coal getting to 23s. 6¾d. per ton as against 6s. 4d. pre-war. Certain it is that even if a portion of this demand be granted, it will introduce further increases and changes in industry. To my mind the only possibility of establishing stability is for the Government, in regard to this and any similar demands from well-organized and well-paid trades, to refuse to entertain them. Then and not till then can we expect the cost of living to recede and a return to more normal conditions.

When shipping owners do not think it necessary (and it is reported that the price of bunker coal is being reduced) to make such profit, possibly there is some hope for us; but meanwhile it is certain every care must be taken to use coal, or indeed any fuel, to the greatest advantage, and expense in connection with our retort-house supervision, plant, &c., which may have paid with coal at under £1 per ton is a different proposition with coal over three times as expensive. It is reported that coal is now loaded at some pits by shovels instead of forks, which possibly accounts for some of our experiences. When coal is dear, one is accustomed to find it short in quantity and bad in quality. We have recently handled some top price Durham coal, which on complaint is alleged similar to that regularly shipped to gas companies without complaint, that from normal results reduced the yield 20 p.ct. and quality 10 p.ct., and owing to faulty steaming and clinkering of generators reduced the production of the carburetted water gas plant by 33⅓ p.ct. It is pointed out, over and over again, that it does not pay to transport rubbish as coal, and that it is sound policy to let gas undertakings have the most suitable coal for their requirements. I am of those who regard the Coal Commission as a most unfortunate occurrence; and it is unthinkable that our country shall be committed to the dictum of the Sankey report on such inconclusive and misleading conclusions. Errors on the part of the Coal Controller and owners' profits were made much of; but the consumers of coal who have to pay came in for scant attention—in fact, the whole inquiry simply served to throw dust in the eyes of the general public.

At first sight, it appears illogical for this country to be exporting its most valuable and essential commodity; but, under present economic conditions, it seems certain that some export of coal is justifiable. Whether with the increased production of coal (due to more miners being at work) we should be starved of coal as at present, while large quantities continue to be exported, is a question which is open to grave doubt. Some proper control in this matter is clearly necessary. It is only fair to state here that I was informed by the Coal Controller last week that restriction of export was being exercised in favour of public utility undertakings.

It will have been observed that the Prime Minister has refused the demand for the nationalization of mines; and any consumer of coal who has the slightest experience in the matter will surely be glad to be free of the menace. If there is one thing more certain than another, it is that State mines, with the inevitable lethargic effect, will not benefit the general community. The miners themselves can be more or less indifferent to the selling price of coal (apart from their participation in the sliding-scale) because they are supplied with what they need at nominal prices. From our experience we have, or should have, a special knowledge of this subject; and it is therefore an instance where we can assist in educating public opinion in correction of the seductive campaign of "Mines for the Miners."

The 10s. coal muddle, so much before us just now, is an instance of what may happen when national interests are made subservient to other considerations. From its very nature, it can only be of a temporary character; and the sooner it is abandoned for an all-round reduction, the better we shall be pleased. I hope care will be taken to specially refer to this as a rebate on the gas, not as a reduction in price, which in certain events may be very misleading and even tantalizing to consumers.

Residuals.

Although the return may not be commensurate with the increased cost of raw material, these important contributions to our

revenue account are realizing better prices—more in keeping with individual intrinsic value. Coke, owing to shortage of coal, is in keen demand and new users are experimenting with it, with advantage as a fuel. Many such will surely be permanent. In some places coke can be exported at remarkable prices. Tar must be worth even more than its present price for road-making purposes. Sulphate of ammonia is selling at better prices; but, against this, the cost of manufacture has increased out of proportion. The new sources of nitrogen should not be lost sight of in this connection; and I would remind you of the Sulphate of Ammonia Association.

There is great need for benzol as motor fuel alone; and for this purpose, when properly prepared, it is a success. Thanks to the Benzol Association it is becoming popular. Unfortunately, all-round consideration of the problem has led a good many of us to regard the production of crude benzol under present conditions as a non-commercial proposition. Where a plant is installed, however, I think it is worth while to retain it and await developments. Generally in the South where chemical works are not numerous, and where so large a proportion of the cost of coal is represented by freights, our return for residuals as a percentage on the cost of coal cannot be expected to compare favourably with other districts.

The works under my control are power-driven, use being made of steam, gas, hydraulic, compressed air, or electricity according to suitability. The higher cost of fuel is enforcing attention to the use of power; and I have in mind to instal a suction-gas producer in connection with an electrical set for continuous power needs. It has been our experience that the introduction of eight-hour work has caused increased demands on the power plant. The following figures in this connection may be interesting and indicate the financial importance of the matter. It is desirable to point out that these figures are on the high side, due to the condition of the plant, &c.

GLYNE GAP WORKS—FUEL ACCOUNT, 1919.

Total fuel as coke	3747 tons 14 cwt.
Value of the fuel at yard price equivalent to 3·88d. per 1000 c.ft. of gas made	£7012 13s. 5d.
Fuel used per 1000 c.ft. of gas made (This is for steam for all purposes including carburetted water gas and power supply.)	19·36 lbs.
Gas used for power, 13·19 c.ft. per 1000 c.ft.	5,721,000 c.ft.
Value of gas at cost into holders (at 0·554d. per 1000 c.ft. made)	£1001 3s. 4d.

NAPHTHALENE.

Naphthalene and I are old friends, or enemies. Following war processes and troubles this bugbear has been causing anxiety; and a word or two may not be unwelcome. Last December the following paragraph appeared in the "Gas World:" "Naphthalene in its capricious moods is not too particular as to the size of pipes which it chokes-up; and it is worthy of present thought that the number of gas undertakings which are greatly harassed by naphthalene troubles to-day seems to be as large as in any previous epidemic. The reports we receive from various sources indicate that, notwithstanding all specifics, the naphthalene 'bogey' is as hale and hearty as ever." I challenge the reference to "all specifics" so far as it concerns the Hastings Carburation Process.

It fell to my lot in 1895 to seek some practical remedy for the cure or prevention of naphthalene in the district. The result was the Hastings Carburation Process now used in many works at home and abroad with more or less complete success. The process was started at the end of the year 1895 and the following is a comparison between the complaints received before and after the installation:

Year.	Number of Complaints of all Kinds.	
1893	4948	Before Process.
1894	4167	
1895	7125	
1896	1667	Process in Use.
1897	768	
1898	616	

Hastings was badly troubled, as these figures show. After working the process for some years, naphthalene ceased to be reported—any district complaints such as there were being due to water or corrosion. Of late, however, the process has been used intermittently, and unsuitable oil, and abnormal conditions of manufacture, have caused some trouble in the last two or three years. The following figures illustrate this:

District Complaints Received Attributable to Naphthalene.

1914	*Nil*	1917	8
1915	*Nil*	1918	114
1916	*Nil*	1919	152

The remedy has been applied—viz., to work the process properly now that it is possible, and I do not anticipate any recurrence. Last November accounted for 119 of the total complaints. There is however another explanation of this incident. It will be remembered that in November the weather was abnormally cold; and, with the removal of rationing restrictions, consumers resumed the freer use of appliances after the war period. This increased demand would call attention to short supplies, which might be attributed to naphthalene; whereas, in fact, corrosion or even water might account for them. It is correct to say that proper installation and working of the carburation process prevent deposits of naphthalene in the district, and assists the lubrication of meters. The essentials are proper oil, regular working, and carburation on the outlet of the governor in such a manner that proper atomization is assured. The process will not rectify although it may minimize faults in manufacture. It will only deal with a certain percentage of naphthalene; but this amount will vary according to the composition of any particular gas supply. In some cases three or four grains per 1000 c.ft. will give trouble; whereas in other cases much larger quantities are harmless. "Prevention is better than cure."

War pressure will have affected us in varying degrees in regard to repairs and maintenance of plant and buildings. At Hastings we could neither get men nor materials to keep our plant, &c., in repair; and although some financial provision was made for the future, it has proved quite inadequate. Our repairs are still in arrear, and this is a more serious matter than it appears on the surface to be. Had the repairs been possible earlier, the cost would have been much less, and the conditions of the various parts would not have been so bad. Much material due for delivery last half year has in our case not yet been delivered, and the delay with such items as meter repairs is well known to all. In the immediate future we must look to an expenditure of more like 1s. 3d. per 1000 c.ft. on repairs of works instead of the old figure of 5d. or 6d.

In addition to the new charter already referred to, and the rectification of the financial position, I look with hope to two other ways in which we may develop to the greater service of the community. The larger gas-works, suitably placed and equipped, should as a fact be more efficient, and thus produce gas more economically than the smaller ones. It, therefore, follows that when distances are reasonable, amalgamation of the large and small works should be advantageous. Fortunately, gas can be handled and distributed under pressure without difficulty. There are many examples which will occur to you; but I would mention the cases of Maidstone and Bournemouth.

The other matter is more visionary, but nevertheless to my mind of great importance. I refer to the amalgamation of gas and electricity works, or co-operation between similar undertakings. There are a number of companies now supplying gas and electricity with an assured future; but now that conservation of fuel is so vital, something more is necessary. In the case of Hastings, I may say without hesitation that combination would have been beneficial to all concerned. For one thing, the local ratepayers would have been relieved of the necessity of contributing £35,000 to the deficits of the Corporation electricity works. For another thing, the Gas Company would have escaped the existing rate-aided competition with the supply of current at non-remunerative rates. The following figures illustrate my meaning:

HASTINGS CORPORATION ELECTRICITY WORKS.
Year ended March 31, 1919.

Total expenditure	£27,716
Total income	20,915
Deficit on year's working	£6,801
Total units sold	916,563
Expenditure on revenue account—average per unit sold	4·51d.
Standing charges, including interest and sinking fund	2·74d.
Total cost per unit sold	7·25d.
Average price received per unit sold	5·07d.
Average works costs	4·13d.

There were sold 885,550 units of current as private supply at various prices—all subject to 20 p.ct. advance:

34·94 p.ct. units sold at	6½d.	
25·87 " " "	4¾d.	
2·42 " " "	4½d.	
0·78 " " "	3d.	
3·81 " " "	2d.*	
32·15 " " "	1¾d.*	

* 2·38d. (Power, &c.).

The striking points in the above statement are the difference between the cost of providing the current and the average price paid by the consumer; also the considerable proportion of the current sold at less than the average works' costs.

The Corporation is its own best consumer; and it is a fetish with members of the Council to displace gas wherever possible. The interest of the ratepayer *per se* is not considered, nor the most advantageous agent for any particular purpose. Thus our public gas lighting, on which we have prided ourselves, is only treated as a convenience—the lamps being converted whenever opportunity offers. The ratepayers pay for the conversion; pay (normally) more than, or else the same as, for gas-lamps; and no one can honestly say that there is any better lighting—especially when diffusion is considered.

Trading at a loss appears to give the department a certain *kudos*, and certainly consumers are attracted—undoubtedly feeling that they are obtaining current to advantage or at the expense of other people. Our local administrators are indeed so satisfied that they have the temerity to propose the establishment of a large central electricity generating station for supplying the town and surrounding district. Hastings is not a good centre; but if such a station be established, surely adjacent to and in conjunction with the gas-works would be the most advantageous location.

Despite the high charges which have to be made, the gas consumption continues to increase generally in the country; and without doubt shortage of fuel and domestic assistance, together with the economy and convenience, will sustain and develop the

demand. Even in America, gas in competition with water-generated electricity goes ahead.

Gentlemen, our industry is most comprehensive, one of which we have every reason to be proud, and one which calls for most able and devoted service. In recent times, we have received high commendation from those who have been in a position to judge of our efforts; and I trust that we may, in the interests of the public, continue to prove worthy of it, never failing to "do with all our might whatsoever our hand findeth to do."

At the close of the address,

Mr. A. CADDICK (Croydon) moved a hearty vote of thanks to Mr. Botley for his address. There was only one opinion in the room; it was that the address was an excellent one.

Mr. L. TREWBY (Mill Hill) seconded the motion, which was unanimously carried.

The PRESIDENT, in replying, thanked the members for their kind attention. He hoped, as Dr. Gray had indicated at the luncheon, that he (the President) would have the pleasure of seeing the members at Hastings. He had said very little about the works of his Company; but, when they visited them, he hoped to give more information.

This concluded the items on the *agenda*.

Gas for Brass Melting.

Describing in a paper read before the New England Association of Gas Engineers the conversion from oil fuel to gas of an open-flame brass melting furnace at Quincy (Mass.), Mr. H. H. Smith said that a No. 4 "Maxon-Premix" burner was installed on the furnace. In the operation of the furnace with oil, it was necessary for a man to come in at 5 a.m. to patch-up the furnace and get ready to run; whereas with gas the man comes in at 7, and the first heat is ready to pour at 8 o'clock. The furnace is used for melting metal composed of 18 p.ct. copper, 10 p.ct. tin, and 2 p.ct. zinc; and the average melt is 1000 lbs. The melts are ready to pour in from 42 to 47 minutes, at a temperature of 2300° to 2350° Fahr. Careful tests were made for shrinkage in metal; and it was found that when using oil the shrinkage was 1½ p.ct., and with gas it was 0·5 p.ct. A porosity test of 42 castings oil melted showed 36 porous; while of the same number of gas-melted castings there were only 6 porous. Fuel used per 100 lbs. of metal melted was determined by a long series of tests; and the figures were: Gas, 400 c.ft.; oil, 3 gallons. The maintenance costs are lower for gas, as, owing to the steady unfluctuating heat from gas, the furnace-linings last a great deal longer. As many as 1100 heats have been obtained in a furnace before re-lining. In addition. there is less noise; and the entire operation is cleaner and more easily handled. Gas is also used for melting standard red brass, the composition of which is 85 p.ct. copper, 5 p.ct. tin, 5 p.ct. zinc, and 5 p.ct. lead. At the same works a gas ladle-heater has been in operation for seven months, and gives no present indication of needing re-lining.

Steam Used by Steam-Jets.

The latest instalment of exact data on the running of steam-boiler plants, by Mr. D. Brownlie, B.Sc., F.C.S., of Manchester, to be reprinted from "Engineering," deals with the amount of steam used by steam-jets. It gives the results of a complete scientific investigation into the quantity of steam taken by nineteen different types of steam-jet appliances on 130 different boiler plants. The object of using steam-jets under or over the fire-bars is to provide a cheap and simple form of forced draught, so as to drive air through the furnace, thus increasing the efficiency of combustion and the amount of fuel burnt per square foot of grate area per hour, Mr. Brownlie found few references in general engineering literature to the steam taken by these jets. The makers of the various types of furnaces and mechanical stokers employing steam-jets as a rule confess to from 1 to 3 p.ct. of the steam production. At any rate, in many years' experience Mr. Brownlie has only heard of one maker who has admitted a figure of over 3½ p.ct. Most of the devices consist essentially of some form of hollow furnace-bar, through which the steam-jets force a current of steam and air, which subsequently passes through the furnace above. The results recorded in tables accompanying the article go to prove that the figures given by a number of makers of steam-jet apparatus are quite erroneous, and that the amount of steam used is seriously in excess of what is generally supposed. The variation between different jets is striking; the lowest figure obtained being 0·5 p.ct. of the production, and the highest 21·4 p.ct. The variation on different plants using the same make of apparatus are also very remarkable. The average figure arrived at is 6·6 p.ct. of the total steam production. Mr. Brownlie points to the great cost of running these appliances, and says that probably about two-thirds of the steam-jets now at work are quite unsuitable for the conditions under which they are used, and should be replaced by mechanical draught. With the remaining one-third, the figure of 6·6 p.ct. should be cut-down to an average of (say) 3·5 p.ct.

Gas and Housing Schemes.—The discussion on "Gas and Housing Schemes," which was opened by Mr. R. J. Rogers at the last meeting of the Midland Association of Gas Engineers and Managers [*ante*, p. 635], will be resumed on Thursday, April 15, at 2.30, at the Grand Hotel, Birmingham.

LOW-GRADE GAS AND GAS-WORKS ECONOMY.

Demonstration in Glasgow by Mr. George Helps before the Scottish Junior Gas Association (Western District).

There was a record attendance of members of the Scottish Junior Gas Association (Western District) on Saturday afternoon, when, in continuation of his propaganda to justify the more general manufacture and use of low-grade gas, Mr. George Helps, of Nuneaton, gave an address and demonstration. Besides the ordinary members of the Association, it was noticeable that one of the lecture rooms of the Technical College, Glasgow, held a numerous representation of gentlemen prominently associated with the gas industry in Glasgow and the West of Scotland. Mr. JAMES DICKSON (the President) occupied the chair.

Mr. HELPS, who had a very cordial reception, said he had first of all to thank the members of the Association for the honour they had done him in asking him to Glasgow. The subject he had chosen for an address was "The Quality of Gas the Consumer Requires, and What it should Cost him." The majority of those present would doubtless have noticed from the Technical Press that a week or two ago he was engaged lecturing at Westminster; and one of his difficulties in addressing the Glasgow audience was to tell them something he did not discuss in London. In connection with this subject, the first thing they had to consider was flame temperature. For the last hundred years or so, gas had been sent out in varying degrees of quality. He supposed most of those present would remember when the gas in Glasgow was over 600 B.Th.U.; and so on this question of flame temperature he was going to talk chiefly about any quality of gas they cared to select. If they took ordinary producer gas as an instance, they were bound to concede that gas of 150 B.Th.U. could give the consumer far better results than gas of 600 B.Th.U. Of late, as they were well aware, a question had come before the National Gas Council and gas authorities relating to the quality of gas that should be sent out. Then, too, he supposed there would be a general cognizance of the fact that, so far as the Board of Trade were concerned, it was agreed that gas of any calorific value should be supplied. Unfortunately, side by side with this concession, the Board of Trade sought to restrict the inerts in the gas. If they could be told why these inerts should be restricted, it might be possible to follow the Government authorities. It would be recalled that, in the report the Board of Trade sent out, the representation was made that users from all parts of the country had acknowledged they could not obtain the flame temperatures they required with gas having more than 15 p.ct. of inerts. He did not know whether any of the members of the Association had been able to discover on what basis this statement had been made. To his mind, this was a very important matter. It seemed, therefore, that the people who had been advising the Government in this direction should come forward with their reasons.

Another question he should like them to consider was why they did not use gas from the holder. The other day in London he listened to a gentleman addressing a number of students; and he put forward the view that gas, in his opinion, should be distributed at not less than from 475 to 500 B.Th.U. This gentleman expatiated at great length on this point, and then proceeded to say that he was desirous of generating electricity cheaply. What did they think he proposed to do? Put in a producer! His own gas was too dear for him. The gas he had at his disposal was too dear; and so he proposed to introduce a producer in order that he could make electricity cheaply. He apparently did not seem to realize that if the gas was too costly for him it was likewise too expensive for the consumer. "If," remarked the lecturer at this point, "we wish to make people believe what we tell them about cheap gas and so on, it is only reasonable that we should be in a position to use it for our own purposes and works."

Mr. Helps passed on to discuss the effects of inerts in gas; and he distributed among the audience a diagram showing graphically the air volume the consumer added to his gas compared with the gas volume, and what he burned with one-stage combustion. Incidentally he mentioned that this diagram had been accessible at the demonstrations in London; and his explanation of it had already been given publicity. He had brought with him to Glasgow a new diagram. This was illustrative of the "Pleno" mixtures of different gases, and showed the results indicated by the figures at the top of the next page.

He had obtained with certainty in a gas of something like 200 B.Th.U. 22,500,000 B.Th.U. There was no disputing this contention, because it was being obtained. Further, there was no difficulty in getting 22,500,000 B.Th.U. in a gas of 150 or 160 B.Th.U. This gas also could be distributed, and distributed without involving any increase of costs. The important point behind all this was, of course, that the distribution enabled them to sell the gas at a much lower figure than hitherto dreamt of.

At this point in the demonstration Mr. Helps submitted a few explanatory notes on the cartoons prepared by Mr. Wallace Coop, which were exhibited at the demonstrations in London. The lecturer here reiterated his argument in favour of complete gasification [see "JOURNAL" for March 16, p. 616]. With gasification, the whole of the 80 p.ct. of carbon in the coal could be put into the main, and instead of having from each ton of coal 6,000,000

A	represents the pleno mixture burned at the burner head when complete combustion is taking place in one stage with . . . . . coal gas, C.V.	676	B.Th.U.	net
B	ditto	550	,,	,,
C	ditto . . . . . mixed gas, C.V.	481	,,	,,
D	ditto . . . . . mixed gas, C.V.	400	,,	,,
E	ditto . . . . . mixed gas, C.V.	345	,,	,,
F	ditto . . . . . mixed gas, C.V.	343	,,	,,
G	ditto . . . . . mixed gas, C.V.	340	,,	,,
H	ditto . . . . . B.W.G., C.V.	273	,,	,,
J	ditto . . . . . producer gas, C.V.	200	,,	,,
K	ditto . . . . . producer gas, C.V.	140	,,	,,

Made by mixing 75·0 p.ct. coal gas, "B," with 25·0 p.ct. B.W.G. "H"
,, ,, 45·9 ,, ,, ,, 54·1 ,, ,,
,, ,, 50·0 ,, ,, ,, 50·0 ,, producer gas "K"
,, ,, 25·0 ,, ,, ,, 75·0 ,, B.W.G., "H"
,, ,, 40·0 ,, ,, ,, 60·0 ,, producer gas, "J"

heat units, there would be 22,500,000 heat units. Throughout the country gas was being sold at from 4s. to 8s. per 1000 c.ft.; and at this rate 30,000,000 heat units were costing the consumer £13, £14, or £20. Yet, if they looked at the matter in the way he was putting it to them, they ought to be able to give the consumer this quantity of heat units, in low-grade gas, for something like £3. The point that they, as gas engineers, had to consider was why they did not do it. It was true they were handicapped by all sorts of restrictions from the Government. Of course, he did not blame the Government—he rather blamed the experts, so-called, who gave their advice to the Government. Furthermore, the reason why the consumer was not having at least three times the heat energy for his money was because of their methods. This question of cheap gas was one of the biggest the country had ever had before it; yet it was one of the simplest. Gas-works to-day were not really gas-works, but chemical works, as only half of the coal consumed was used in gas making. To his mind, it was a significant fact, and one typically illustrative of the national saving that could be effected, that Glasgow's gas cost nearly £1,600,000, whereas it need cost only £600,000.

Touching finally on the question of distribution, Mr. Helps said that the cartoons prepared by Mr. Wallace Coop visualized the correct idea. The point might be raised, "Yes, but what about holders?" They did not require holders at all if they carried out the ideas he was advocating. "When the time comes," facetiously remarked the demonstrator, "when you are making gas at ten times the rate you are doing to-day, what do you want to put it into a holder for? If the consumers do not want the gas, then don't make it." Under the scheme he had in view, it would be possible to equalize pressures throughout a district without increasing the mains. He was not going to dogmatize and say that this particular idea should be followed; but it was a suggestion. In Scotland, gas was costing the consumers £40,000,000 a year; and the point he was most anxious to emphasize was that the consumers could have this gas for about one-third of the money. For £13,000,000 they ought to get what they were paying £40,000,000 for. He was not suggesting that every undertaking in the country should immediately get to the standard of manufacturing gas of 200 B.Th.U. The better way would be to make it a gradual, progressive, and experimental process.

Following the demonstration by Mr. Helps, an opportunity was afforded to the members for discussion and questions. A few queries were addressed to the lecturer; but no point of exceptional interest emerged.

At the close of what, by universal consent, was voted a profitable demonstration, the lecturer was awarded a vote of thanks.

Evening Star Lodge No. 1719.

The Installation Meeting of this Lodge took place on Wednesday of last week at the Freemasons Hall, when Bro. A. C. Beal was installed W.M. for the ensuing year. The officers appointed were as follows:

W.M.	W.Bro. A. C. Beal.
I.P.M.	W.Bro. H. W. Packham, P.P.G.D. Surrey.
S.W.	Bro. Corbett W. Woodall.
J.W.	W.Bro. Charles Clare.
Chaplain . . .	W.Bro. Jacques Abady, P.M., L.R.
Treasurer . . .	W.Bro. Walter T. Dunn, P.M., L.R.
Secretary . . .	W.Bro. Arthur Valon, P.M., L.R.
Dir. of Ceremonies	W.Bro. F. J. West, P.M., Pr. S.G.D. East Lancs.
S.D.	Bro. Frank Jervis.
J.D.	Bro. Frank West.
Organist. . . .	W.Bro. J. Fred Wicks, P.M.
I.G.	Bro. Rae P. Normand.
Stewards . . .	W.Bro. Reginald W. Foster, L.R. Bro. G. D. Bidwell.

A presentation of a silver fruit basket was made to Bro. John F. Simmance, on his retiring from the position of organist, which he had held for many years. The outgoing W.M. (W.Bro. H. W. Packham), in making the presentation, said that it was a token of the high regard and affection which all the brethren felt for Bro. Simmance. Everyone very much regretted that he was retiring from the position he had filled so well; and the W.M. expressed the thanks of the brethren for the kind services he had rendered in the past.

The New Patents Act.—Sections 1 and 2 of the Patents and Designs Act, 1919, come into operation on April 1. Section 1 provides that action can be taken to ensure the proper use of patents which have not, within four years of the date of the patent, been worked satisfactorily in the United Kingdom on a commercial scale. Section 2 prescribes the conditions under which licences for the use of patents shall be granted.

LONDON AND SOUTHERN DISTRICT JUNIOR GAS ASSOCIATION.

There was a meeting of the Association at the Westminster Technical Institute, Vincent Square, last Friday evening, presided over by Mr. S. B. CHANDLER, of the South Suburban Gas Company.

NATIONAL ASSOCIATION OF TECHNICAL GAS OFFICIALS.

The PRESIDENT said that before they proceeded with the business of the evening, he would like to refer briefly to the National Association of Technical Gas Officials. Members would recall that some time ago they were circularized by this organization. Since that time, he had been to Birmingham, to attend a meeting of the Joint Junior Associations Council; and their Association had been asked to appoint a representative to be present at any conferences which might be held in connection with the new organization. He found that the other Junior Associations had appointed representatives; and by taking the same course, their Association would be kept informed as to what was going on. The Council had therefore chosen the Senior Vice-President (Mr. F. J. Pearce) to represent the Association at any meetings which might from time to time be called. He had no mandate to put forward in any way the views of the Association, but would merely go, and then report to the Council what was done.

HEAT CONSERVATION AND WATER GAS.

Mr. EDWARD G. STEWART, of the Fulham works of the Gas Light and Coke Company, had promised to read a paper on "Heat Conservation and Water Gas." But unfortunately he was laid up with influenza, and so had to get Mr. L. Lacey, of the Bromley works of the Gas Light and Coke Company, to read the paper, upon the preparation of which the President said Mr. Stewart had been engaged for nearly a year. Sympathy was expressed with the author in his disappointment at not being present to read the paper himself.

The paper will be found on pp. 750-54. At its conclusion, Mr. Lacey replied to a few questions that were put to him.

Mr. W. NEWTON BOOTH (Woolwich Arsenal) proposed a hearty vote of thanks to the author for the great amount of work he had put into the paper, and to Mr. Lacey for having read it.

Mr. F. J. PEARCE (Mill Hill) seconded the vote, which was cordially passed.

Mr. LACEY, in acknowledgment, suggested that perhaps at some future date Mr. Stewart might be afforded an opportunity of answering any questions which members might care to put to him on the subject of the paper.

Informal Meeting of Scottish Gas Managers.

The Thirty-Seventh Annual Informal Meeting of Scottish Gas Managers will be held in the Hall of the Royal Philosophical Society, Bath Street, Glasgow, on Wednesday, April 7, at 2.30. The President, Mr. John M. Smith, of Stirling, will deliver an address; and the meeting will have before it the resignation of Mr. J. W. Napier, of Alloa, as Convener.

National Association of Technical Gas Officials.—A meeting was held at Birmingham on the 25th inst. of the Midland District members of the Association. There was a large and representative attendance. A District Committee was elected, and other formal business transacted. This meeting is the first of a series which will be held during the next few weeks throughout the British Isles. Arrangements are being made for a general meeting of members in London during Institution week.

Calorific Value of Gas on the Pacific Coast.—At a dinner in San Francisco of members of the Pacific Coast Gas Association, Mr. L. S. Ready, the Chairman of the California State Railroad Commission's Joint Committee on the Efficiency and Economy of Gas (appointed as the result of a discussion of the British thermal unit question at the Los Angeles convention of the Association last September) told his hearers of the events that preceded the appointment of the Committee. The matter having been taken up with the Gas and Electric Department of the Railroad Commission, this body engaged to undertake a thorough investigation. This investigation, he said, was one likely to take from one to two years before a definite determination could be reached as to the best quality of gas for manufacture and distribution, and the best for the consumer to use. It had been decided to make practical tests at certain plants. The Railroad Commission have, for the present, fixed the standard at 570 B.Th.U.; but they are perfectly willing to consider the supplying of gas below this standard.

HEAT CONSERVATION AND WATER GAS.

By EDWARD G. STEWART.

[A Paper read before the London and Southern District Junior Gas Association on Friday, March 26.]

The combustion of a ton of coal releases some 30 million B.Th.U. of heat energy. Of the total quantity of coal mined in this country over 80 p.ct. is raised and distributed wholly for the purpose of realizing, to a greater or less extent, this heat energy. In domestic use, the proportion usefully utilized never exceeds 20 p.ct. or 6 million B.Th.U. per ton. In the generation of steam the best modern boilers deliver 80 p.ct. of the energy in the steam; but the poor thermodynamical properties of this fluid so reduce the figure that by the time the steam has done its work in producing (say) electrical energy, the proportion of the original energy of the coal usefully employed is but 10 p.ct. at the best.

To the chemist, and to the carbonizing engineer, coal, besides being a combustible solid, represents a combination of complex hydrocarbons, capable of division by distillation into fuels, solid, liquid, and gaseous—each possessing properties capable of more extensive and more efficient application than the parent substance, together with the production of chemical products so essential to modern civilized life.

At a distillation temperature of 1800° Fahr., representing present-day practice in gas-works, the distribution of products per ton of coal is as follows: Coke, 0·75 ton; gas, 0·17 ton; tar, 0·05 ton; ammonia, sulphur, &c., 0·03 ton. Assuming that one-fifth of the tar is of value for fuel purposes in the form of benzol and heavy oils, the division is 93 p.ct. fuel and 7 p.ct. chemical bye-products. Valuable as the bye-products are, essential in peace and war as they are, the fuel aspect of the distillation still remains the major one, and more especially so now that regulations are about to come into force having as their basis the official recognition of gas as a fuel.

In the best modern carbonizing practice the thermal balance of distillation is:

Heat in coal	30 million B.Th.U.	or 100	p.ct.
,, gas	7·5 ,,	,, 25	,,
,, tar	1·8 ,,	,, 6	,,
,, coke	19·8 ,,	,, 66	,,
Loss on carbonization	0·9 ,,	,, 3	,,

The heat for the process is obtained by the combustion of a portion of the coke produced—nearly 25 p.ct., so that

Heat in coke available for sale is	15 million B.Th.U.	or 50	p.ct.
Heat in coke used for fuel is	4·8 ,,	,, 16	,,

The distribution of heat in the coke used for fuel is:

Used in heating retorts	2·58 million B.Th.U.	or 8·6	p.ct.
Loss in ashes radiation and convection	1·02 ,,	,, 3·4	,,
Loss in sensible heat of flue gases	1·20 ,,	,, 4·0	,,

While the heat given to the retort is absorbed thus:

In the carbonization of coal	0·90 million B.Th.U.	or 3·0	p.ct.
In the hot gases leaving	0·69 ,,	,, 2·3	,,
In the hot coke leaving	0·99 ,,	,, 3·3	,,

The figure of 25 p.ct. heat energy production in the form of gas represents the most up-to-date practice in mass carbonization, and shows no likelihood of being exceeded in any pure distillation process. Assuming that heat energy in the gaseous form is of more value to both producers and consumers in the gas industry than in either the solid or liquid form, the conversion of coke into gas affords the prospect of economy for gas undertakings. To effect this, advantage is taken of the chemical properties of carbon in forming two oxides, both of which are gases, and one of which is combustible. Heat energy is developed in the production of either.

The oxidizing media commonly employed are air and water. In air, the oxygen exists as a mixture with four times its volume of nitrogen; in water, as a compound with twice its volume of hydrogen—the bond between the two gases in water being capable of dissolution by the superior attraction of carbon for oxygen at high temperature. The oxidation of carbon to combustible carbon monoxide results in the evolution of one-third of the total potential energy of the carbon, so that only two-thirds can appear in the gas.

The decomposition of steam requires the application of heat energy to an amount which is returned in the combustion of the resulting hydrogen.

The gases derivable from carbon can be classified according to the oxidizing media employed in their production.

I. Air-Carbon or Generator Gas.	II. Steam-Carbon or Water Gas.	III. Air-Steam-Carbon or Producer Gas.
H_2 . . . —	50 p.ct.	17·0 p.ct.
CO . . . 31·7 p.ct.	50 ,,	39·9 ,,
N_2 . . . 65·3 ,,	—	43·1 ,,
B.Th.U. . . 119 per c.ft.	330	196
Incombustibles 65·3 p.ct.	—	43·1 p.ct.

In gas-works practice, they are met with—

(I.) For heating retort-settings, and in the production of water gas.

(II.) As a diluent for coal gas and admixed with oil-gas as an auxiliary plant.

(III.) Also known as suction and Dowson gas, for driving isolated power plants, and to a limited extent in retort-heating.

It will be noticed that both gases I. and III., even in their ideal states, contain large percentages of incombustible constituents, and so are not suitable for mixing with coal gas on account of the cost of distribution, and the effect of inerts in reducing the efficiency of combustion. Water gas (II.), besides being the richest, does not suffer from this limitation; and in ordinary manufacture it contains less diluents than coal gas made under very exacting conditions.

STEAM-CARBON REACTION.

If a mass of carbon fuel be enclosed in a vessel provided with means for raising the fuel to a temperature above 1600° Fahr., and steam be passed through the bed, the chemical reactions will be:

$$(A)\ C + H_2O = CO + H_2.$$

That is 50 p.ct. each hydrogen and carbon monoxide, and 100 p.ct. of combustible. This reaction is markedly endothermic; and unless means be provided to maintain the temperature, it is reduced, when the reaction changes towards:

$$(B)\ C + 2H_2O = CO_2 + 2H_2.$$

That is 66 p.ct. hydrogen and combustible. This reaction requires only two-thirds of the energy required by the other. Normally, there is issuing from the zone at the base of the fuel bed a mixture of CO_2, CO, H_2, and undecomposed steam. In the upper zones of the bed, these react with each other and the fuel thus:

$$CO_2 + C = 2\,CO$$
$$\text{and}\quad H_2O + CO = CO_2 + H_2$$

the four gases bearing a relation to each other according to the temperature of the zone such that

$$\frac{CO \times H_2O}{CO_2 \times H_2}$$ equals a constant for any given temperature.

This equilibrium takes time to be fully effected; the period becoming longer with lower temperatures. With sufficient time contact, the final composition of the gas is fairly represented by Diagram I., where the temperature may be considered as the mean of the reduction zone.

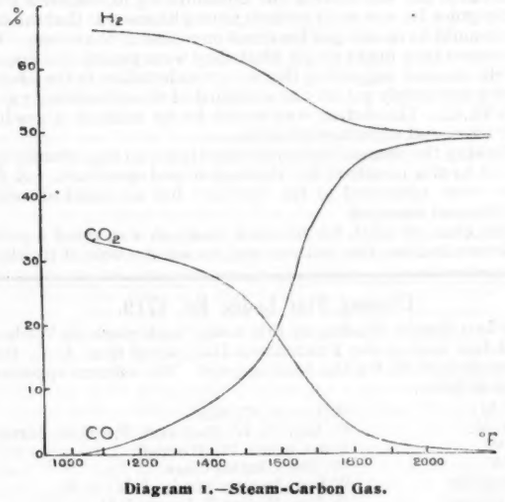

Diagram 1.—Steam-Carbon Gas.

As the aim in water-gas manufacture is to produce a gas of maximum combustible content, it is essential to keep the reduction zone at as high a temperature as possible—not below 1700° Fahr., and to allow the gas sufficient contact for the maximum reduction of CO_2. The essential conditions then are:

(1) Close regulation of the steam flow, to prevent excessive formation of CO_2 and to limit the amount of undecomposed steam.
(2) Slow rate of flow of gases.
(3) Deep fuel bed.
(4) Large reacting surface of fuel—*i.e.*, fuel of even size, lying in open texture, so as to get maximum surface exposure.

THERMAL CONSIDERATIONS.

Reaction A may be read that 12 lbs. of carbon unite with 18 lbs. of steam to form 30 lbs., or 715 c.ft., of water gas. Now the decomposition of 18 lbs. of steam in gaseous form requires 104,000 units of heat, while the combustion of 12 lbs. of carbon to carbon monoxide yields 51,600 units—resulting in a net loss of 52,400 units.

A further unavoidable loss of heat exists in the form of the sensible heat of the water gas leaving the generator. Generally, the gas issues from the reducing zone at a temperature of 1200° Fahr. At this figure, the 30 lbs. of water gas would carry off another 16,400 units. Thus, the gasification of 12 lbs. of carbon

and 18 lbs. of steam requires the supply of 68,800 units of heat giving a thermal balance

In	Heat energy of 12 lbs. of carbon	174,000	B.Th.U.
	Sensible heat of steam	20,124	,,
	Heat supplied to maintain temperature	68,800	,,
Out	Heat energy of 715 c.ft. of gas	246,524	,,
	Sensible heat of water gas	16,400	,,

The supply of this 68,800 units of heat can be effected in two ways.

(1) By surrounding the generator by a furnace, and heating it externally in the manner of a coal-gas retort.
(2) By steaming the generator intermittently, and in the intervals restoring the temperature by forcing air through it to burn a portion of the fuel.

Referring back to the data respecting the carbonization of coal, it will be noticed that, of the heat energy of the coke used for fuel, some 50 p.ct. is given to the retort. Assuming similar conditions in water-gas manufacture, the supply of 68,800 units would necessitate the combustion of 9·5 lbs. of carbon. Such a definite statement is not so easy in the case of the internal heating method, as results can be obtained varying widely according to condition.

The Air-Carbon Reaction.

If air is blown into a body of fuel, above its ignition temperature, the carbon is first burnt to CO with evolution of 4300 units per pound of carbon, and then to CO_2 with further evolution of 10,200 units for the CO equivalent of one pound. The CO_2 in passing through the hot carbon fuel above is reduced to CO again, reabsorbing the 10,200 units. The hot CO_2 tends to raise the fuel-bed temperature; the reduction to CO to lower it. And so an equilibrium is set up, which normally prevents the temperature from exceeding 1800° Fahr. The reduction to CO is dependent upon the temperature of the upper zone; and so the resulting gas has a composition varying with this temperature, as shown in Diagram II., provided that the time of contact is sufficient.

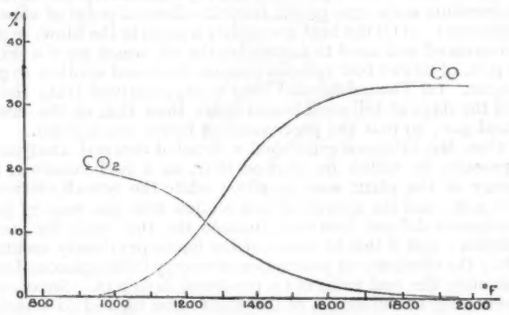

Diagram 2.—Air-Carbon Gas.

No matter what reactions take place in the generator we have

(1) That, as 1 lb. of carbon produces equal volumes of CO or CO_2, the relative percentages of these gases in the blow products represent the proportion of carbon burnt to each.
(2) The heat energy developed is equal to the sum of the heat developed respectively by the proportions burning to CO and CO_2.

Now, 1 lb. of carbon burning to CO_2 develops 14,500 B.Th.U., and assuming a specific heat of the products of 0·25 the heat energy carried away in the exit gases is 3·13 times their temperature. And 1 lb. of carbon burning to CO develops 4300 B.Th.U., and the heat in the exit gases is 1·69 times the temperature, as sensible heat above 60° Fahr.; while there is a further 10,200 units of potential heat of combustion in the gases.

Four cases representative of conditions met with in practice will be assumed.

(1) Where the fuel is burnt, 90 p.ct. to CO_2 and 10 p.ct. to CO, and the temperature of the exit gases is 1800° Fahr.
(2) The fuel burnt 50 p.ct. to CO_2 and 50 p.ct. to CO, and the exit gases at 1200° Fahr.
(3) The same, but the gases at 1500° Fahr.
(4) The fuel burnt 90 p.ct. to CO and 10 p.ct. to CO_2, and the gases leaving at 1500° Fahr.

We have then:

Energy in One Pound of Carbon Fuel, 14,500 B.Th.U.

	I.	II.	III.	IV.
Heat given to fuel	9238	6528	5635	2569
Sensible heat of gases leaving	4242	2872	3765	2751
Combustion heat of gases leaving	1020	5100	5100	9180

So that the generation of 68,800 units for heating the fuel would need approximately:

	7·5	10·5	12·2	27 lbs.

or a total fuel supply to the generator of:

	19·5	22·5	24·2	39 lbs.
or per 1000 c.ft.	27	31	34	54 lbs.

To secure efficiency, then, the carbon must be consumed as far as possible to CO_2, and the temperature of the exit gases kept low. A cool top zone of the fire tends to both; so that the passage of steam in a direction opposite to the flow of air possesses a distinct advantage, more especially as the water gas is passing through fuel zones of increasing temperature. This leads to good reduction and gas quality. In practice, the adoption of down runs is limited by the risk of extinguishing a portion of the fire top, and by the influence upon the position of the zone of maximum temperature, which is important in connection with clinker formation.

The reduction to CO in blowing is dependent upon time contact. High CO_2 content of the blow-gases can be secured by reducing this contact by using shallow fuel-beds, coupled with high velocity of the blast.

With a pure carbon fuel, the practical losses of heat energy are:

(1) As sensible heat in the water gas.
(2) ,, ,, ,, undecomposed steam.
(3) ,, ,, ,, the blast gases.
(4) ,, heat of combustion of blast gases.
(5) By radiation and convection from the apparatus.

This latter amounts to from 5 to 15 p.ct. of the total turnover of heat energy. Where the fuel is coke, there are in addition losses (6) from the heat taken away with the clinker and in any coke unconsumed removed with it, amounting to 1 to 3 p.ct. of the total energy.

Economical working is to be secured by reducing these losses to a minimum compatible with successful gas making, and then recovering the waste heat energy in some direction in which it can be used in connection with the plant or else returned to the thermal cycle.

Steam Generation.

No account of the thermal conditions pertaining to water gas can be complete without consideration being given to the question of the fuel consumed for the steam supply to the generator and the essential ancillary plant of blowers and exhausters. For the production of 715 c.ft. of water gas 18 lbs. of steam are theoretically needed—that is 25·1 lbs. per 1000 c.ft. In practice, the quantity usually admitted is in the neighbourhood of 30 lbs., while the ancillary plant will absorb another 60 lbs., or 90 lbs. in all. Where the retort method of generation is employed, no steam is required for blowers; but the loss in steam distribution to the retorts more than balances this saving. With a modern boiler plant installation, the thermal efficiency of steam production is as follows:

	Coke as Fuel. Per Cent.		Breeze as Fuel. Per Cent.
Heat in steam	75	..	55
Heat in waste fuel gas	18	..	29
Heat loss in radiation and convection	5	..	9
Heat loss in furnace refuse	2	..	7

A pound of steam at 100 lbs. pressure raised from water at 60° Fahr. contains 1157 units of heat, equal to a consumption of 0·106 lb. of carbon or 9·5 lbs. of carbon for 90 lbs. of steam.

Summarizing the hypothetical cases:

	I. P.Ct.	II. P.Ct.	III. P.Ct.	IV. P.Ct.	V.
Blowing—					
CO_2	90	50	50	10	Possible Retort Generator
CO	10	50	50	90	
Temperature of blow waste gases	1800°F.	1200°F.	1500°F.	1500°F.	
Carbon consumed for water gas making per 1000 c.ft.	16·3	16·3	16·3	16·3	16·3
Carbon consumed for heat supply to generator	10·5	14·7	17·1	37·7	13·2
Loss by radiation	3·0	3·0	3·0	3·0	Included
Total consumed in gas making plant	29·8	34·0	36·4	57·9	29·5
Consumed in steam generation	9·5	9·5	9·5	9·5	9·5
Total of all fuel consumed	39·3	43·5	45 9	66·5	39·0
Overall thermal efficiency	58 p.ct.	52 p.ct.	50 p.ct.	34 p.ct.	58 p.ct.

While these figures are based upon the use of pure carbon as fuel, the fuel ordinarily employed (coke) contains only 90 p.ct. of carbon, but the diluents contained in commercial water gas reduce the proportion of pure water gas in it to about the same percentage; so that these efficiencies compare closely with those actually found.

Development of Water Gas Manufacture.

The process of development of the manufacture of water gas can be divided into four overlapping epochs:

(1) The externally heated retort: 1830-1880 and 1905 to date.
(2) The intermittent cupola generator making ordinary or blue water gas: 1849 onwards.
(3) The intermittent cupola generator making carburetted water gas: 1874 onwards.
(4) Present practice.

The Externally Heated Retort.

In 1824, Ibbetson passed steam through the spent charge in a horizontal retort. In 1830, Donovan attempted to improve upon the idea by passing the resulting water gas into another heated retort fed with tar, the gas from which was to act as an enricher. With the appliances of the day, the gas produced was of high CO_2 content, the fuel account tremendous, and the processes failures. Nevertheless, experiment continued for many years on these lines. The points that mitigated against success were (*a*) the comparatively small amount of the heat developed in the furnace transmitted to the contents of the retort—not more than 25 p.ct. (*b*) The difficulty of attaining the high temperatures necessary. (*c*) The further difficulty of transmitting sufficient heat to the centre of

the charge. (*d*) High capital cost. (*e*) Difficulty of control. The process was abandoned about 1880. In the early years of the present century, however, the idea was partly renewed in connection with the intermittent vertical retort. The spent charge in these was steamed during the last two hours of the carbonization period. Apart from the volume of water gas produced, its passage through the retort tended to an increased yield of coal gas by preventing the degradation of the hydrocarbons.

During the war the necessity for economy in coal consumption led to this idea being extended to other vertical retort systems—notably the continuous; and to a limited extent to other retort plants. Many surprising results have been published, but all are remarkable in the absence of data from the point of view of water gas production. According to data given by Mr. Blundell, there is an additional consumption of coke per ton of coal of 74 lbs. Assuming this to result in the formation of 1500 c.ft. of water gas, his division corresponds to:

	Per Ton of Coal.	Per 1000 C.Ft.
Converted into water gas	25 lbs.	16·6 lbs.
Additional fuel for the reaction	25 ,,	16·6 ,,
Fuel for steam supply	24 ,,	16·0 ,,
Total	74 ,,	49·2 ,,

an overall efficiency of 45 p.ct. of the heat of the coke as water gas.

In steaming vertical retorts, the conditions are dissimilar according as the retort is worked intermittently or continuously. In the former case, towards the end of the carbonizing period the retort contains a column of coke, the bulk of which is at a temperature sufficient to complete the water gas reaction. The effect of steaming will be to gradually reduce the temperature from below upwards; so that the decomposing zone will gradually rise, with a corresponding shortening of the reducing zone. The quality of the gas will be good at first, and fall off if the steaming be too long continued. The two-hour period should allow of good water gas being made for that period with careful regulation.

On the other hand, with the continuous retort this rise of the zone of decomposition is not permissible. Heat must, therefore, be supplied to the base of the retort to supply that which is absorbed. A high temperature, too, is essential, so that sufficient heat shall pass to the centre of the retort through the poor conducting coke. The reducing zone is comparatively shallow as an inverted cone of partly carbonized coal reaches well down the retort and forms a ready outlet for the unreduced gas. High CO_2 content may, therefore, be expected, and is in fact one of the difficulties experienced.

The manufacture of water gas in vertical retorts, too, is attended by deterioration in the quality of the coke produced. The combustion of the surface of each lump naturally increases the ash percentage; while with some distributions of ash, the coke bears a half-burnt appearance.

On the whole it would seem, that while with modern furnace construction water gas manufacture combined with distillation in vertical retorts is possible, difficulties of control, capital and working cost, coupled with thermal inefficiency, will prevent its general adoption in favour of separate manufacturing plants.

Intermittent Process.

In 1849, Gillard introduced the cupola generator in which the heat energy for the reaction was secured by burning part of the fuel with an air-blast, between intervals of steaming. In 1874, Strong devised a plant in which the blow-gases were burnt in vessels filled with brickwork; and during the run the steam was pre-heated by passing through these. In 1879, Wittenstrom placed two of these plants back to back, and surrounded the stacks with a steam-boiler. The best-known of the early plants, however, was the European, which was developed in Germany. One was introduced by Mr. Samson Fox to this country at the Leeds Forge in the early eighties. Sundry mishaps with it led to water gas receiving a bad name. Compared with present-day plants, the features of the apparatus were the absence of down-runs and the use of a low blast-pressure. This led to the blowing resulting in nearly complete combustion to carbon monoxide. A long blow was thus necessary—some ten minutes; while the run was five minutes. In consequence, the generator fuel reached 60 lbs. per 1000 c.ft.

In 1896, much attention was focussed upon the art of blowing by the plant developed by Mr. Dellwik. By using a thin fire and positive blast the major portion of the blow combustion was completed to CO_2. A generator fuel account of 32 lbs. per 1000 c.ft. was thus secured. The process had disadvantages in the shape of uncomfortable operating conditions and in dust produced, and has gradually been discontinued. The principle, however, has been maintained. In the Kramer and Aarts plant two generators are used—blown in parallel with thin fires, and run in series equivalent to a thick fire. Further economy is secured by burning any combustible blast gases in the brick chamber, using the heat thus stored to pre-heat the steam. The fuel account is similar to the Dellwik plant; and some comparison with the old European generator is illustrated by Cases I. and IV. *ante*.

Carburetted Water Gas.

Until recent times the value of the staple product of the gas industry was based upon illuminating value. Water gas being a "blue" gas, held few claims to the industry's interest. In 1874, however, Thaddeus S. C. Lowe, a Virginian, conceived the idea of spraying petroleum oil on to the fuel in the generator during the run, with the object of producing a gas approximating in composition and illuminating value to coal gas by the admixture of oil and water gas. The idea was soon copied and improved in the United States, where the availability of suitable raw material in the shape of anthracite and oil from near-by fields led to the development of the gas as a competitor to coal gas. This competition resulted in much recrimination and jobbery between the rival interests, which was fostered by the erection of inferior carburetting plants. Later a combination of the makers of the carburetted water gas plants was formed; and by the elimination of all inferior apparatus, a standard design was produced which, in its essentials, has stood the test of thirty years' working throughout the world. This plant consists of a generator arranged for steaming in either direction; followed by a carburettor filled with checker brickwork for the decomposition of the oil; and succeeded by a similar vessel (the super-heater) for fixing the oil vapours—these vessels being heated by the combustion of the blow gases.

In 1889, an American (Van Steenburgh) exhibited a plant in London making 24-candle gas. The ever-rising price of cannel coal then used for enriching the coal gas led Mr. Trewby, then Chief Engineer of the Gas Light and Coke Company, after seeing this plant, to visit America. As a result, there was erected at the Beckton station of the Company in 1890 a plant upon the improved Lowe system, the last relics of which have only been removed this year. This plant was the pioneer of many such in this country, so that at the present time over 25 p.ct. of the industry's output is produced by this means. Apart from the value of the gas as an enricher it possesses the following advantages:

(1) Simplicity of operation.
(2) Rapidity of starting and stopping.
(3) Small ground-space.
(4) Low capital cost.
(5) Control of the coke market.
(6) Few impurities and small purification plant.
(7) Improved labour conditions.

The combination of oil and water gas represented a great advance upon previous water-gas plants from the thermal point of view for two reasons: (1) Of the heat previously wasted in the blow, 30 p.ct. was recovered and used to carbonize the oil, which gave a return of 80 p.ct. of its raw fuel value in gaseous form and another 10 p.ct. in the tar. (2) The additional heat energy derived from the oil was in the days of full enrichment more than that of the uncarburetted gas; so that the percentage of losses was halved.

In 1890, Mr. Glasgow published a detailed thermal analysis of the process, in which he showed that, as a fuel machine, the efficiency of the plant was 61 p.ct.; while the overall efficiency was 81 p.ct., and the energy of conversion into gas was 71 p.ct. These figures did not, however, include the fuel used for steam production; and if this be taken at the figure previously assumed (9·5 lbs.) the efficiency of production of energy in the gaseous form, not counting the fuel value of tar produced, is 64 p.ct. Successive improvements in the design of the plant have tended to improve these results. They stand, however, as the classic and unchallenged figures under the then obtaining conditions—viz., a gas of 600 to 700 B.Th.U. gross value.

Accurate as the results were, they have given rise to a general belief in the high thermal efficiency of carburetted water gas manufacture under all conditions. With the development of the use of gas as a fuel, the necessity for illuminating value has given way to calorific requirements. The use of oil has gradually been reduced—the rise in price of the commodity precipitating this reduction, and opening the way to the manufacture of water gas, only slightly if at all carburetted, for use as a diluent of coal gas.

Calculating Mr. Glasgow's figures on a basis of water gas made, the previously mentioned generator, and the combined generator and boiler, efficiencies of gasification of 71 p.ct. and 64 p.ct. become reduced to 58 p.ct. and 42 p.ct. Broadly, after allowing for the improvement in details of manufacture, the effect of stopping the use of oil has been to bring "blue" water gas manufacture in carburetted water gas apparatus back to the conditions assumed in Cases II. and III. *ante*—*i.e.*, an overall efficiency of 50 p.ct.

To again increase this figure, advance must be made in two directions:

(1) Improvement in methods of blowing.
(2) Useful recovery of heat energy wasted.

Both old and new types of plant are amenable to improvement in these directions; and those responsible for their operation would be well advised to reconsider their methods in the light of the altered conditions of present-day practice.

In passing it may be mentioned that, recently, successful plants have been constructed wherein the waste heat from the blow is used to heat retorts placed above the generator. The coal charged into these retorts is distilled, and the coke passed below for conversion to gas. Little has yet been published as to the results of the process, which are anticipated with interest.

Plant at Fulham.

In 1900, there was erected at the Fulham station of the Gas Light and Coke Company an installation of carburetted water gas plant. This was redesigned and rebuilt in 1909, and added to in 1919, to have a present total capacity of four million c.ft. per day. The apparatus is arranged in three contiguous buildings, the western sides of which are formed in their entire length by No. 1 retort-house. At the north end of the block is a single-storey building with basement, 44 ft. wide by 66 ft. long, housing the machinery. It contains one No. 10 Sturtevant fan propelled

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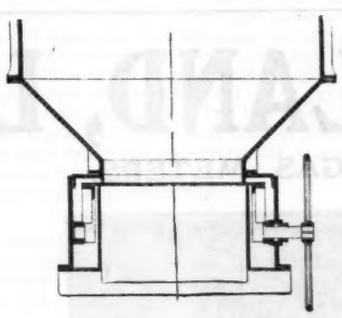

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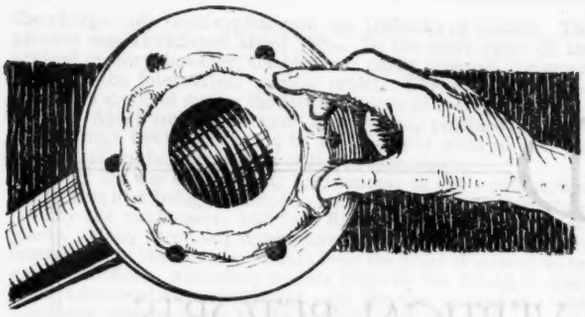

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At the northern extremity of the block is a two-storey non-basement building, housing (on the ground level) three Lancashire boilers, each 28 ft. long and 7 ft. diameter. On one side of these is a small pump-room. The boilers are worked at 120 lbs. pressure, which is reduced in the generator house to 100 lbs. All three are now fitted with Wilton's forced-draught furnaces, and consume breeze. In the pump-room are duplicate pumps for the circulating water and hydraulic pumps which supply the boilers with feed-water and the coke and clinker lifts at a pressure of 120 lbs. per square inch. The accumulator is situated near by. The lift exhausts are returned to the suction tank, and the feed-water heater is on the pressure side of the pumps. Above the boilers is a lobby for the use of the operatives of this plant and the adjoining retort-house. It is in two portions, a meal room and a dressing room and lavatory. The floor and walls are tiled, and the clothes lockers are of steel. The roof of this building is entirely formed by the tar separating and circulating water storage tank.

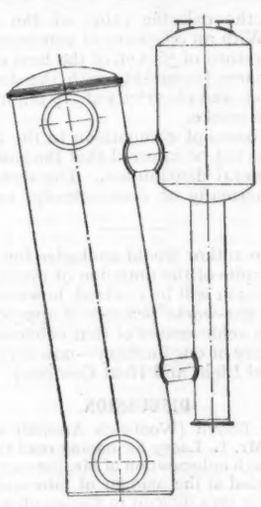
GENERATOR HOUSE.

This occupies the centre of the block. It is 100 ft. long by 50 ft. wide, and from basement to eaves is 50 ft. high. The three plants are erected on the ground level, from which staircases lead up to the operating stage and down to the basement. The ground floor forms the clinkering stage, and around the generator bases are steel shutes so arranged that all clinker, &c., as withdrawn falls into the basement, and when quenched is removed in barrows and brought up by lift.

The apparatus housed here are: Nos. 1 and 2 carburetted water gas plants, erected in 1909 by Messrs. Humphreys and Glasgow. They have twin-generators arranged for series-running and parallel-running in the upward direction only. Blowing is always in parallel. Their capacity is just over a million c.ft. per diem each with "blue" water gas, and over a million and a quarter c.ft. per diem each when working carburetted gas to the extent of 2·5 gallons of oil per 1000 c.ft.—a total of over two and a-half millions daily. The No. 3 blue water gas plant was erected in 1919 by Messrs. Humphreys and Glasgow, having a capacity of over one and a-half million c.ft. daily. This plant consists of a single generator followed by a recuperator, similar in construction to the carburettor of a carburetted water gas plant, having secondary and tertiary air inlets at top and bottom. In it any unconsumed blast gases are burnt, and the hot gases and also the hot water gas pass from the base into the waste-heat boiler. This boiler was the first to be erected on any gas-works in this country and merits special description.

WASTE HEAT BOILER.

The boiler consists of two portions. The water drum is an upright cylinder standing with a slight incline backwards, divided into top and bottom gas chambers, which are connected through the middle or water chamber by over two hundred 3 in. tubes.



The Waste-Heat Boiler.

The water is on the outside of the tubes. The steam drum is a smaller vertical cylinder connected by a branch to the side of the water chamber at its upper end, and by a vertical stem and branch to the side of the water chamber at its base. Upon it are mounted the usual Hopkinson boiler fittings of water and steam gauges, feed, stop, deadweight, and spring safety-valves, also the high and low water gear. The boiler delivers steam at a pressure of 100 lbs. to the square inch. After giving off a branch to the generator, the steam main enters the main steam main of the plant through a stop-valve. From the top gas chamber, connections are given off to the right and left to the stack-valve and to the washer and outlet main respectively.

The gas from the two carburetted sets passes through scrubbers outside the building, and from the blue set direct into a collecting main outside the building, nearly on a level with the operating floor; thence through a set of water-tube condensers to the exhauster or the relief holder of 234,000 c.ft. capacity. From the exhausters the gas passes through a set of atmospheric condensers; then through one cyclone and two Pelouze and Audouin tar-extractors to eight purifiers, each 37 ft. by 20 ft., thence to a station meter of 150,000 c.ft. per hour capacity. No. 3 set is fitted with steam-meters, while indicating and recording pyrometers are available for use in any of the plants.

Coke is loaded from a trap in the conveyor of the retort-house adjoining into skips holding about 5 cwt. It is raised to the operating floor by a hydraulic lift, and at the top it passes over a weighbridge to the various generators. The boiler feed water is metered. The hot water from the water-tube gas condensers is utilized for the feed of the main works' boilers, and is delivered at 110° Fahr.

The gradual falling-off of the gasification efficiency previously commented upon will be apparent. The results obtained from the new blue water gas set are almost identical with Series G, with the exception that no boiler fuel is required. The gasification efficiency is thereby increased to 70 p.ct. The thermal efficiency is calculated thus:

$$\frac{1000 \times \text{Cal. Value of Gas}}{\text{Pounds of Coke} \times \text{Cal. Value} \times \text{Oil} \times \text{Cal. Value}}$$

As to the working of the carburetted water gas sets. During the ten years these have been at work many combinations of operation methods have been employed and experimented with.

Cycles.—With the best possible coke a 1½-minute blow and a 5½-minute run have been successfully worked. Usually, however, the quality of the fuel was not uniformly good, and a cycle which stood the test of several years' working was 1½ blow and 4½ run. Later, as the quality of the coke became poorer, as a result of war conditions, 2 and 5 minutes was found more satisfactory; and with fuel of high ash content 3 and 5 minutes has at times been needed. With the commencement of the working of the new plant the cycle has had to be adjusted to a six-minute total; it being found that the new generator gives the best result, so far, on a 2·4 cycle. As a consequence, the steam supply has been adjusted to suit this arrangement; and the actual periods are varied between 1½-4½ and 2·4 as required. This variation of time is found to be an easy method of control where the steam regulation has to be carried out by the minute adjustment of several regulating cocks. Generally all time lost in purging and changing-over is deducted from the blow period; so that the actual hourly periods of steaming and blowing with the various cycles are:

Cycle.		Blowing.	Steaming.
1½	5½	10½ minutes	45 minutes.
1½	4½	11½ ,,	43 ,,
2	5	13½ ,,	40 ,,
2	4	15½ ,,	38 ,,
3	5	18 ,,	36 ,,

Steaming.—The generators are always steamed in series; so that each one is steamed up and down alternately. During the last minute of the run they are placed in parallel, in order to clear away from the base of the generator the gas, which would otherwise explode on opening the blast.

With good fuel, parallel steaming has been worked at the commencement of the run, with increase in make. On the similar but larger plants at Beckton the connections are available for up and down running in parallel, and by working the plant as a double generator set in this way an advantage of 30 p.ct. in make can be secured. With the idea of easing the labour of clinkering, the last three runs before clinkering are always made parallel and upwards.

Clinkering.—This operation is carried out every four hours. During the second clinkering of each shift the false bars are not inserted nor are the dust interceptors emptied. The normal times taken are 18 and 10 minutes respectively.

Depth of Fire.—Until the installation of the 75 H.P. blower the maximum blast obtainable beneath the grate was 15 in. water pressure. With this quantity of air, no advantage was experienced in working a thin fuel bed, which was, therefore, kept at 5 ft. 6 in. to 6 ft. 6 in., the fuel being burnt approximately 50 p.ct. to CO_2 and 50 p.ct. to CO. With the larger blower, however, with either set blowing singly, 18½ in. pressure can be secured; and a 5-ft. fire enables the fuel to be blown 65 p.ct. to CO_2 with advantage to the make and fuel account. Ordinarily, when all three sets are at work, the carburetted water gas sets are operated simultaneously in parallel, giving a 15 in. pressure as before, so as not to clash with the third set when blasting.

Carburetting.—Of recent years the oil-heaters have been removed and 2·5 gallons of oil per 1000 c.ft. can be successfully cracked without them. The maximum use of oil was 3 gallons per 1000 c.ft. The normal working temperature of the carburettor is 1350° Fahr., and of the superheater, 1300° Fahr. The oil pressure to the sprays is 40 to 60 lbs. to the square inch.

Quality of Gas.—Whether working blue or carburetted gas, the

control is aimed at a CO_2 content of 4 to 5 p.ct.; while it is not difficult with good coke to obtain results as low as 3·5 p.ct. Purging is carefully watched; and the nitrogen content is from 5 to 7 p.ct.

No. 3 Blue Gas Plant.—This plant was put to work in October, 1919; and the demand for gas has not permitted much experimenting with the cycle, which has been kept at 2·4, with satisfactory results.

Steaming.—Control of this is considerably easier than on the other sets, as much aid is lent by the steam-meters. Down-runs are worked, usually on alternate runs, according to the fuel.

Clinkering.—This is done as before, every four hours. The larger generator necessitates the insertion of the false bars every time; hence the duration averages 25 minutes on each occasion. Owing to this, the advantage of the stack flaps is felt considerably more.

Depth of Fire.—The blast pressure beneath the grate is 18 in., and the fuel bed is worked at a depth of 5 ft. 6 in., resulting in over 60 p.ct. combustion to CO_2.

Quality of Gas.—As with the other plants the CO_2 is kept between 4 and 5 p.ct., but the single generator is not so efficient in this respect; thus the figure more nearly approaches the upper limit. The smaller volume of dead-space, however, gives advantage in the purging; so that the nitrogen content is from 3 to 5 p.ct.

Waste-Heat Boiler.—As all the blow gases are consumed for firing the boiler, the CO_2 content at the stack exit of the blast gases averages 18 p.ct. throughout the blow. In order to secure perfect combustion, the auxiliary air valves are opened gradually in stages throughout the blow. The blow gases enter the recuperator at about 1200° Fahr., and when burnt reach the boiler base at 1800° Fahr. The water gas at the commencement of the run is at 1450° Fahr. The temperature of the top gas chamber is constant at some point between 400° and 500° Fahr. depending upon the rate of steaming. As the temperature of the boiler water is 330° Fahr., the high efficiency of the boiler will be noted. The boiler is blown down every clinkering period, and is washed out every two or three weeks in one shift.

Labour.—When on full work, the installation employs per shift: Three gas makers; eight men fetching coke, clinkering, and removing furnace refuse; one exhauster and machinery attendant; one boilerman; one trimmer; and, in the daytime, one attendant to all wells, drips, and tar-tanks.

(equal to 300,000 B.Th.U.) there are no less than 74,000 B.Th.U. escaping as sensible heat in the gases leaving the apparatus, and 70,000 B.Th.U. as potential heat in the combustible gas in the blast products—a total of 144,000 B.Th.U., or the equivalent of over 10 lbs. of coke or ½ cwt. per cycle. If this is the waste on a plant which is considered in an efficient state, what must the total loss be on the water gas plants of this country?

In the description of the waste heat boiler it was mentioned that at full output the gas temperature at the outlet was 400° to 500°, while the gases from the generator and recuperator were 1300° and 1800° respectively. The heat extracted then would be during the blow, $\frac{13}{18} \times 116$, or 83,800 B.Th.U.; during the run, $\frac{8}{13} \times 28$, or 17,200 B.Th.U.—a total of 101,000 B.Th.U. recovered per 1000 c.ft. of gas.

This quantity of heat is equal to an evaporation of 104·6 lbs. of water from and at 212° per 1000 c.ft. of gas made. In normal working, the waste heat boiler of No. 3 set actually evaporates 8000 lbs. of water per full hour. The gas made in this time is 75,000 c.ft., or an evaporation (from and at) of 107 lbs. per 1000 c.ft., or an average of 168,000 lbs. per 24 hours. As this quantity is in excess of that required to operate the generator and its proportion of ancillary plant, this boiler renders some assistance to the main boilers.

Results from the No. 3 Set.

These are very similar to those of Series G—viz.: Cycle, 2·4; make per 24 hours, 1,500,000 c.ft.; CO_2, 4·8; CO, 41·0; fuel for generators (gross), 39·6 lbs. (net) 35·5 lbs. per 1000 c.ft.; gasification efficiency, 70 p.ct. This increase of gasification efficiency from 50 to 70 p.ct. is an important consideration. Thermally, it replaces water gas as an efficient industrial process; financially, the saving is such as to refund the capital cost of the boiler in under two years.

Complete Gasification of Coal.

If all the available coke produced in the carbonization of coal were gasified with an efficiency of 70 p.ct., then of the original energy of the coal that of the coal gas would be 25 p.ct., or 13,400 c.ft. of 560 B.Th.U., that of the water gas would be 35 p.ct., or 35,000 c.ft. of 300 B.Th.U., giving a total return of 60 p.ct. of the heat

—	Cycle.	Make per Day per Set.	Oil Used, Gallons, per 1000 C.Ft.	CO_2.	CO.	Generator Fuel.		Boiler Fuel.		Gas, B.Th.U.	Thermal Efficiency of Gasification.
						Gross.	Net.	Coke.	Breeze.		
A. . . .	1½ 4½	1,300,000	2·50	4·1	30·5	30·7	29·1	9·0	..	545	62
B. . . .	1½ 4½	1,250,000	2·30	4·0	33·1	31·8	29·8	10·0	..	526	60
C. . . .	2 5	1,250,000	2·00	4·6	34·0	33·0	30·9	10·2	..	496	59
D. . . .	2 5	1,100,000	1·50	5·0	35·5	36·1	31·4	11·2	..	452	58
E. . . .	2 5	900,000	·50	4·3	40·2	43·2	37·6	12·4	..	333	49
F. . . .	2 5	960,000	..	4·8	40·3	40·4	36·4	..	17·0	296	55
G. . . .	2 4	1,050,000*	..	4·3	41·0	39·6	35·7	..	16·1	300	57

* To 1,150,000 with increased blast pressure.

Results of Working.—The working results of the carburetted water gas plants under the old conditions of 15 in. blast are appended. The figures are abstracted from half-yearly averages, and are not "record" results. With the higher blasts, the results of runs of working over short periods indicate an advantage of 10 to 20 p.ct. over these figures.

Steam Consumption.—From readings of the water-meter from time to time, it has been established that the steam consumption of the carburetted plant is 86 lbs. per 1000 c.ft. of "blue" gas made. The approximate division of this quantity is: Generators, 30 lbs.; blowers, 28 lbs.; exhausters, 13 lbs.; pumps, 8 lbs.; condensation, 7 lbs. With the forced-draught furnaces at work, the actual consumption is 90 lbs., the difference being the quantity used for blast production in the boiler furnaces. At the normal feed temperature of 140° Fahr., this amount of steam is equal to 100 lbs. from and at 212°—that is, a fuel consumption of 11 lbs. of coke or 17 lbs. of breeze.

Thermal Balance.—A detailed examination of the thermal conditions prevailing in Nos. 1 and 2 plants along the lines previously suggested led to the following result. The operating conditions were those of Series G., and the blast 15 in. pressure below the grate. Total coke fed to generators 40·4 lbs. per 1000 c.ft.; net coke fed to generators 35·4 lbs. per 1000 c.ft.; net carbon fed to generators 30·6 lbs. per 1000 c.ft. The energy received per 1000 c.ft. of gas made was: Combustion energy of carbon as fuel 443,000 B.Th.U.; total heat of steam to generators 36,000; sensible heat of air blast 1000—total 480,000 B.Th.U.

The energy given out was: Heat of combustion of water gas, 300,000 B.Th.U.; sensible heat of water gas leaving, 28,000; heat of combustion of blast-gases, 70,000; sensible heat of blast-gases, 46,000; radiation and convection, 30,000; sensible heat in ash, unconsumed fuel, 6000—total, 480,000 B.Th.U. This shows a gasification efficiency for the generator only of 62·5 p.ct. In this instance the generator blast-gases averaged: CO_2, 14·6 p.ct.; CO, 11·3 p.ct.; N_2, 74·1 p.ct. This is equivalent to 56 p.ct. combustion to CO_2. Thus net carbon fuel for the boilers per 1000 c.ft. was 9·4 lbs. So that the overall gasification efficiency was 51·7 p.ct.

It will be noticed that for every 1000 c.ft. of water gas produced energy of the coal in gaseous form, coupled with complete recovery of all the valuable tar, ammonia, cyanogen, sulphur, and other bye-products.

From the sparse data published concerning combined or double gas plants, one gathers their thermal efficiency is from 70 to 75 p.ct.

In either case the calorific value of the mixed gas is 370 to 390 B.Th.U. With an efficiency of combustion of 60 p.ct. this is equivalent to a return of 36 p.ct. of the heat of the coal as work done, which compares favourably with the domestic grate at a maximum of 20 p.ct. and electricity at 8 p.ct., in both of which the sole bye-product is smoke.

In reducing the bases of comparison to the terms of complete gasification, it must not be inferred that the author would propose such a gas for general distribution. The demand for coke as a fuel cannot be, thermally or economically, met in entirety by gaseous firing.

In conclusion the author would apologize for the length of this communication in spite of the omission of much matter originally intended. His mission will be realized, however, if the extent of heat energy loss in gas-works practice is appreciated with a view to recovery, for the achievement of that efficiency which can only tend to the prosperity of our industry—now ever nearing Winsor's dream of a National Light and Heat Company.

DISCUSSION.

Mr. W. Newton Booth (Woolwich Arsenal) said they were all greatly indebted to Mr. L. Lacey for having read the paper in the regretted absence through indisposition of Mr. Stewart. He (the speaker) had been rather startled at the amount of information they had had given to them. It was very difficult to discuss off-hand a paper of this nature, which consisted first of all of a statement of the theoretical conditions underlying gas manufacture, and then of the results obtained when these conditions were applied in actual works practice. Referring to the author's tables, 58 p.ct. was not a very satisfactory overall thermal efficiency. The waste-heat boiler proposal was too important to be lightly passed over. They should be grateful to the author for bringing this particular matter before them, because it was one which

showed in a practical way how some of the heat could be saved and turned to very useful account in reducing the amount of fuel going through the plant.

Mr. W. GROGONO (Bromley-by-Bow) said he was sure that when they came to study the paper carefully at home, they would find it contained a vast amount of useful information.

Mr. W. BELL (Reading) remarked that the difference between the thermal efficiency, when using the ordinary plant and with the waste-heat boiler, quite justified the introduction of this system.

Mr. F. J. PEARCE (Mill Hill) said he had been particularly looking forward to the paper, because he thought Mr. Stewart was going to talk about the waste-heat boiler, which he (the speaker) had had the advantage of seeing. When he inspected the boiler at Fulham, his feeling was one of amazement, to think that the waste heat from an ordinary water-gas plant—because, after all, it was but an ordinary water gas plant, with the boiler—was sufficient to produce the steam required, not only for the generator, but also for the blowers and auxiliary plant. The results from the plant appeared to be excellent; and, to his mind, what had been done was quite enough to show that a waste-heat attachment to the water-gas plant was quite the thing of the future. It appeared from the paper that they clinkered every four hours; and one clinkering took ten minutes and the other eighteen minutes. He would rather like to know how this was done, with the present quality of fuel. It would be a real pleasure to him to be able to show similar figures. He noticed that Mr. Stewart had had the oil-heaters removed from the plant; and he wondered if any of the members had had experience of the carboning-up of oil-heaters in these days, when the quantity of oil was considerably reduced. He himself found it was impossible to work with the oil-heater, because the travel was so slow that carboning-up occurred, until complete blocking resulted; and the heater had therefore to be removed. There was no other way out of the difficulty.

Mr. F. W. STAPLETON (Gas Light and Coke Company), alluding to the steaming with vertical retorts, said it had been found that thereby the temperature of the retorts was considerably reduced; and the result was a decreased throughput. Though the thermal efficiency as regarded B.Th.U. per ton of coal might be greater, it seemed, working continuously, that it did not pay. Water gas made in a separate plant appeared to be far better than steaming vertical retorts.

The PRESIDENT (Mr. S. B. Chandler) remarked that they had heard a good deal just recently about the gas of the future; and as the industry had evidently not yet made up its mind as to what would be the best kind of gas to supply, the paper came at a very opportune moment. Mr. Stewart must have devoted an enormous amount of labour and time to its preparation; and the Association should congratulate themselves that among their members they had a man who could put such information before them. The description of the waste-heat boiler at Fulham was particularly interesting.

Mr. LACEY (who was complimented by various members on the manner in which he had submitted a paper with which until that evening he had had but very slight acquaintance) said, as to clinkering times, with the water-gas plant with which he was connected they were not so fortunate, though, with good fuel, he thought it averaged about twenty minutes per four hours. No doubt the author had given them the best, and not the worst, conditions. The oil-heaters certainly constituted a difficulty now. On his own plant they had two sets in which the oil-heaters had been removed; and they could thus vary the amount of oil used. At the request of the meeting, he gave a fuller description of the waste-heat boiler, a model of which had been sent along by Mr. Stewart.

French Coal Prices.

The "Journal des Usines a Gaz" for March 20 gives the text of an order dated Jan. 20 by the Minister of Public Works for regulating gas-coal prices. As from March 1, the prices of home-produced and imported coal used by the gas industry were to be equalized by a continuation of the 75 fr. tax now existing on the former, and by payment to the gas companies of a fixed grant of 150 frs. per ton on seaborne imported coal. Detailed instructions have been issued by the Coal Controller for the working of the scheme, which appears to be greatly simplified by the existence in Paris of a Society that controls all the buying of gas coal for the French works. To this Society, the individual undertakings will pay the tax on French coal; and from it they will draw their allowance on imports. Thus the undertakings deal only with a Society which understands their needs; and the Society settles accounts for the whole industry with the Controller. Some such equalizing system as the above would appear to be urgently necessary, when the prices at which coal is exported from England, and the rate of exchange, are considered. At the present rate, 150 frs. are equivalent to about £3.

A decree has recently been ratified by the French Senate and Chamber of Deputies forbidding the exportation or re-exportation of sulphate of ammonia. A further decree has been made prohibiting (as from the beginning of March) export from the country of tar and all tar products obtained from coal distillation. Exceptions to this decree will only be made by special authorization of the Ministry of Finance.

The Liberal Anti-Nationalization Committee has been formed to resist nationalization, because it is opposed to the principles on which Liberals rely for the reconstruction of industry and the social advancement of the people. It is proposed to make clear to the people the grave objections which there are to nationalization, and to convince them that in liberal social reform, and not in collectivism, lies the true line of deliverance from present economic inequalities. One of the members of the Committee is Mr. J. H. Balfour Browne.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

Oxide Purification.

SIR,—I notice in the interesting article, on oxide purification, communicated by Dr. G. W. Anderson, the gas velocity is calculated on the full horizontal section of each box; whereas it depends upon the total area of the free interstices of the oxide.

A rough determination for a given depth of material in the condition usually employed shows that this area is 25 p.ct. of the total; and the fact that the area of the interstices before sulphiding increases with finer division supports Dr. Anderson's opinion of the importance of the physical condition of oxide to secure good working results.

SAMUEL TAGG.

Preston, March 27, 1920.

Workmen's Compensation Insurance.

SIR,—In view of the notices which have been given by Insurance Companies of an increase of 10 p.ct. on the premiums paid for Workmen's Compensation Insurance, to cover the recent increase of benefits under the Act, it should be emphasized that all premiums have automatically increased with the increase of wages and the bonuses thereon; but the actual risk of accident has not increased at all—the number of men insured having remained practically unaltered. The increase of premiums on the vastly higher wages ought to have covered the increased compensation.

The well-known Iron Trades Employers Insurance Association, that has existed a good many years, and is, the writer believes, in a very strong position, is a good example of what could be done.

The gas industry is said to employ 100,000 men or more; and the total wages insurable amount to several millions. It would seem that a scheme of mutual insurance for the whole gas industry (excepting where self-insured) on the lines of the Iron Trades Association would be a payable proposition which might well be advocated by the united authority of the National Gas Council with great benefit to both companies and municipal bodies, and would be entirely self-supporting.

MUTUAL.

London, March 25, 1920.

Wehrle's "American Gas-Works Practice."

SIR,—I was interested in reading your review of my book "American Gas-Works Practice" in the Feb. 3 issue of the "JOURNAL," and am glad you found it worthy of such considerable mention. I am not writing this to join issue with any of the comments you made, but simply to offer an explanation which to some extent may account for the shortcomings that were apparent to you.

In the first place, the "Gas Age" asked me to write a series of articles pertaining particularly to gas company fitting work. We found when we began to draw-up our outline that there were a thousand and one things that the fitter ought to know, and which were supplemental to his work. We thought he should know something about the properties of gas and the rudiments of gas manufacture, in addition to quite a lot about the various phases of gas distribution. We knew if we told him all about the gas business, or even as much as we pretended we knew about it, that the series would be so long that before it would be finished the material would be antiquated. As we had decided to put the articles in book form, the pages were being printed and the type distributed as rapidly as the articles appeared.

We ran the articles under the title of "Instructions for Gas Company Fitters; but the farther we got along with the manuscript the more we were convinced that the title was inappropriate. Our final decision was to add certain chapters, and while we would still dedicate the book to the fitter (a courtesy that had never been extended to him before), we would address the work to every gas company employee who desired to study the gas business from an elementary view-point only. We spent considerable time trying to decide upon an appropriate title for the book; for we knew that it was not a complete encyclopædia of the gas business, as no other book on the same subject is at the present time. The title chosen, "American Gas-Works Practice," was we thought as nearly appropriate as any other, inasmuch as the words "Gas-Works" implied any work connected with the gas business, and did not refer particularly to the gas plant.

I believe you will agree that the subjects handled in the most detail in the work were those that had received the slightest attention in gas literature heretofore available, which was as we had intended. We started out with an idea of originality, and only intended to "hit the high spots" on paths that had already been well trodden. The gas engineer will find lots of untechnical parts to this book, and will, perhaps, gain but little in reading it. But we believe the employee—the ninety and nine, not the one—will find as much of real value to him as in any similar piece of gas literature on the market to-day.

I hope this explanation is of some worth, and that it will be accepted in the same friendly spirit as written.

GEO. WEHRLE,
Superintendent, Gas Department,
Denver Gas and Electric Light Company.

Denver, Col., U.S.A., March 5, 1920.

Management of Gas-Cookers.

SIR,—Having carefully read Prof. Smithell's remarks on "Smoke Abatement," the point that counts therein, and hits the mark, is—educate the gas consumers, but first educate the gas manager, then he and his staff can educate his consumers.

The gas-fire is perfectly hygienic, if used properly; and so is the gas-cooker. But this is my point—How many gas managers are there to-day who know how a gas-cooker should be used? What they do know is there have been shoals of complaints from users.

All this has now passed away. I have found out someone who does know; and my gas consumers who have cookers or are having

one installed are handed a card "How to Manage a Gas-Cooker." It is the one and only instruction handed to them. It gets there. I have proved its value.

Gas Manager.

March 27, 1920.

National Association of Technical Officials.

Sir,—If your contributor, "Do it Now," will forward me a copy of the correspondence he refers to, I shall be only too pleased to answer to the best of my ability any questions he has put.

As I only took over the secretaryship on the 15th inst., I cannot plead guilty to this omission; but, to use the old Army expression, "We regret the incident; and the matter shall have our careful consideration in the future."

F. Herbert Stevenson, General Secretary.

55, *Temple Row, Birmingham, March* 22, 1920.

[This letter was received after last week's issue of the "Journal" was published.—Ed. G.J.]

Sir,—I have read with interest the letter of "Northman," in your issue of March 23, and would like to point out to him a few of the considerations which govern appointments of gas managers to-day.

The Hyde gas managership was advertised at £300 per year, and the post of manager vacated by the successful applicant is advertised at £260 per year.

Recently there have been several appointments made to gas managerships of about £300 per year; and for all these posts we read that there were from thirty to fifty applicants.

The facts are that there are many authoritities who have not realized that officials should be granted advances to meet the extra cost of living to the same extent as workmen; and the number of such authorities is very large.

A few days ago this Council advertised for a Sanitary Inspector (the chief official) at a salary of £175 per year with an advance of £25 at the end of one year's service. They have received 48 applications for the post—all of them from qualified men, some of whom have gained high distinction in the army.

There is always a large number of qualified men who for one reason or another (maybe, temporarily out of a berth, or struggling along on a pre-war salary, or assistants willing to make a monetary sacrifice for the sake of being a manager) send in applications for gas managerships, no matter what the salary offered is; and until appointing authorities are compelled by higher powers to offer adequate and fair comparative salaries, such appointments are bound to be made. How otherwise is the position to be met?

H. Higham.

Teignmouth District Council Gas-Works, March 28, 1920.

The Llandudno and Other Gas Appointments.

Sir,—Your readers will probably be interested to read the following letter which has to-day been sent to the Chairman of the Llandudno Gas Committee.

I shall be greatly obliged if you can kindly find room in the "Journal" for its insertion.

F. Herbert Stevenson, General Secretary.

55, *Temple Row, Birmingham. March* 26, 1920.

[Enclosure.]

To the Chairman and Committee, Gas Department, Llandudno Urban District Council.

Sir,—My Committee have noted your advertisement for a Gas Engineer for the Llandudno Gas Department, and have instructed me to draw your attention to the fact that the salary you are offering for the post is not one that will attract a thoroughly competent man, unless he, out of economic necessity, has no other option. If an appointment is made under the conditions specified, you cannot obtain satisfaction, as you will either appoint someone unqualified for the position, or one who will only remain with you until he can obtain something better.

One of the chief objects of this Association is to improve the calibre of men in the profession; and this cannot be done unless the remuneration obtainable is sufficient to attract some of the best brains available.

My Committee, without desiring in any way to appear to dictate or interfere unduly in this matter, respectively suggest that a salary of £450, and a house, is the minimum amount that should be paid for this position.—Yours faithfully,

(Signed) F. Herbert Stevenson, General Secretary, Association of Technical Gas Officials.

A similar letter has also been sent to-day to the Chairman of the Gas Department of the Bollington Urban District Council.

Heraldry—A Discovery?

Sir,—Although the subject-matter of this letter is rather outside the usual lines of the technical fare provided by the "Journal" for the gas industry, it is thought that such a unique discovery [?] would be at least of passing interest to many of your readers. After all, a note in other vein, remote from that appropriate to these strenuous times, may not come amiss.

Rumaging among the dark corners of an ancient building in a pleasant Midland town, the writer came across a coat of arms complete with crest and motto; and in the hope that the family to whom it belongs may be identified by some of your readers, a careful copy of it is enclosed, together with a description in (approximately) suitable heraldic terms.

Evidently an attempt has been made by someone to translate the motto, because in faint pencilling beneath the original appear the words "None eaten."

The knot in the lion's tail is a most unusual heraldic device; but it may be a play on the word (k)not; and hence this has been described as "rejectant." The consumer with the ham of ancient lineage is most difficult to understand; but many surmises may be made.

Judy Spree.

March 22, 1920.

Description of the Coat of Arms.

Argent, a chevron gules, between three novel burners, pleno, sable; on a chief azure, a consumer grasping a ham, passé, and the sun in splendour or; on a canton argent, a coop proper pencillé. Crest: On a mound vert, a lion disputant and rejectant. Motto: Rien faisant.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

Progress of Bills.

The Maidenhead Gas Bill was reported, with amendments.

The Wandsworth, Wimbledon, and Epsom District Gas Bill was read the third time, passed, and sent to the Commons.

The Risca Urban District Council Bill was read the third time, passed, and sent to the Commons.

South Metropolitan and South Suburban Bills Committee.

The South Metropolitan Gas Bill and the South Suburban Gas Bill are among a number of Bills to be considered by the following Select Committee, who will sit on Tuesday, April 27: Marquis of Bristol (Chairman), Earl of Caithness, Earl of Chichester, Lord Clifford of Chudleigh, and Lord Oriel.

Coal Production Bill.

The Coal Production Bill, "to make better provision in the national interests for the production and development of coal and certain other minerals, and for purposes connected therewith," was presented by Lord Gainford, and read the first time.

A Bill to Prevent Dumping.

The Protection of Special Industries Bill has for its object to prevent dumping, and to establish a Special Industries Council to advise as to the promotion and assistance of special industries. Where it appears to the Board of Trade that the prices habitually charged by the consigner of any class or kind of goods imported into the United Kingdom, or that the prices at which imported goods of any class or kind are usually sold or offered for sale in the United Kingdom, are less than the prices at which goods of the same class or kind are sold in the ordinary course of business in the country of origin, the Board may prohibit the importation of such goods, except under such conditions as the Board may order. For the purpose of advising the Board as to the measures necessary to be taken for the promotion and assistance of special industries, there shall be established the Special Industries Council. The expression "special industries" in the Bill means industries supplying commodities which are essential to the national safety, as being absolutely indispensable to important industries carried on in the United Kingdom, and which are entirely or mainly supplied from countries outside the United Kingdom. It shall be the duty of the Council to watch the course of industrial development, and, in consultation with the Department of Scientific and Industrial Research and any other Government Department interested in any special industry, to advise the Board as to the promotion and assistance of the special industries set out in a schedule, and any other industry which in the opinion of the Council is a special industry. The industries named in the schedule include synthetic dyes, illuminating glassware, and thorium nitrate.

HOUSE OF COMMONS.

Progress of Bills.

The Wandsworth, Wimbledon, and Epsom District Gas Bill and the Risca Urban District Council Bill were read the first time, and referred to the Examiners.

Rating of Machinery Bill.

A Bill introduced to amend the law relating to the rating of hereditaments containing machinery has for its object to secure uniformity of practice, and to assimilate the law in England and Wales to that which prevails in Scotland. In the construction of any enactment relating to the gross estimated rental, gross value, annual value, net annual value, rateable value, or assessable value of any hereditament for the purpose of any local rate, or of the basis or standard thereof, or of any valuation list, or of any water-rate or water-rent, the word "hereditament" shall be deemed to include such machinery only as is fixed or attached to the hereditament. In the case of any hereditament occupied for any trade, business, or manufacture, the expression "fixed or attached" shall be construed as applying to all machinery, machines, or plant in or on the hereditaments for producing or transmitting first motive power or for heating or lighting such hereditament, but, save as herein provided, shall not apply to machines, tools, or appliances which are only so fixed that they can be removed from their place without necessitating the removal of any part of the hereditament. The Act shall extend only to England and Wales.

Midland Gas-Works Coal Supplies.

Mr. MARRIOTT asked the President of the Board of Trade whether he was aware of the serious position in which the gas undertakings in the Midland area, and notably in Oxford, found themselves in consequence of the inadequate supplies of coal, and of the large percentage of inert material contained in the supplies they obtained; and if the expense to the undertakings and to the State, involved in compelling a South Midland town to obtain its supplies from Durham instead of from contiguous coalfields, had been taken into consideration.

Mr. BRIDGEMAN, who replied, said he was aware that considerable difficulties were still being experienced in securing adequate supplies of coal to gas undertakings, and that complaints were being received as to the quality; but all possible steps were being taken to remedy the position. The matters mentioned in the last part of the question were given full consideration to, in connection with the formulation of the scheme for improving supplies of coal forinland consumption.

Mr. FINNEY asked the President of the Board of Trade whether his attention has been drawn to a communication from a meeting of the Midland Association of Gas Engineers and Managers, held in Birmingham on the 11th inst., indicating the difficulty experienced in obtaining adequate supplies of coal, and expressing apprehension at the shortage of gas coal, reserve stocks in several industrial towns being only two or three days, and in the majority less than one week's supply, and asking that gas coal might be given priority, in order that reserve stocks might be built-up to four weeks' consumption, and also asking that, as many Midland towns were being seriously penalized financially by being required to take coal from outside their geographical area, compensation might be paid.

Mr. BRIDGEMAN, who replied, said his attention had been drawn to the meeting referred to. As regards the question of supplies to gas-works in the Midland area, he referred to the answer given above. He could not recognize any claim for compensation for extra costs arising out of the present abnormal conditions.

Liquid and Gaseous Motor Fuel.

Captain TUDOR REES asked the Prime Minister what steps he proposed to take to give effect to the report of the Profiteering Committee that the price of petrol was excessive and without justification.

Mr. BRIDGEMAN, who replied, said the Board of Trade proposed to discuss further with the compantes the various items of cost to which the Sub-Committee called attention; but even were it found possible to effect a temporary reduction, he thought the fact must be faced that the demand for motor spirit was growing more rapidly than the supply, and that, short of complete international control—which was hardly a practical proposal—the most effective method of preventing an increase of price was the use of other forms of liquid or gaseous fuel. The Board of Trade were examining the various possibilities with the assistance of the Fuel Research Board. There were difficulties in the way of an extended use of gas, particularly the fact that supplies of town gas were not too plentiful. It was hoped that it would be possible in due course to increase the production of benzol; but this, again, would be a limited quantity. The greater use of alcohol was no doubt one remedy, but a good deal of research, both as to possible sources of supply and the provision of a cheap and efficient denaturant, would be needed; and if would, he feared, in any case be a long time before large quantities could be expected to be available.

Wages in the Nottingham Gas Department.—Members of the clerical staff of the Nottingham Corporation gas undertaking have recently been affiliated with the National Union of General Workers, which is one of the most numerically strong of trade union organizations; and upon their behalf Mr. Arthur Hayday, M.P., the District Secretary, headed a deputation who waited upon a Special Committee of the City Council appointed to consider applications for increases of salary. The deputation were informed that full consideration had been given to the matter; and the Committee submitted proposals for increased salaries. The principle of making permanent the present war bonuses has been agreed upon; and the rates will stand until there is either 25 p.ct. rise or fall in the cost of living.

Torquay Gas Company.—The report presented at the annual meeting of the Company showed a balance of £7656 on the profit and loss account. The Directors recommended that a final dividend should be declared of 2½ p.ct. on the shares bearing a maximum dividend of 10 p.ct. (making, with the interim dividend, 7½ p.ct. for the year), and 1¾ p.ct. on the shares bearing a maximum dividend of 7 p.ct. (making 5¼ p.ct. for the year). The Chairman (Mr. A. Iredale) expressed the fear that disappointment would be experienced by the shareholders. The consumption of gas for the past year exceeded all previous records. The deficit on the year's working amounted to £1106; and the Directors had applied to the Board of Trade for power to vary the clause in their Act restricting the maximum charge to 4s. 3d. per 1000 c.ft.

MISCELLANEOUS NEWS.

LONDON COUNTY COUNCIL AND GAS TESTING.

The Parliamentary Committee, in their report to be submitted to the London County Council to-day, state that the Council last February decided to oppose, and to present a petition against, the Wandsworth, Wimbledon, and Epsom District Gas Bill introduced into Parliament in the session 1920, and expressed the opinion that the proposals embodied in the Bill for raising additional capital required to be modified substantially, and that the Company should be subject to control in regard to gas testing similar to that now obtaining in the case of the three Metropolitan Gas Companies. With regard to the question of capital powers, the Committee understand that, in response to the Council's representations, the Company are prepared to reduce the amount of new capital by £50,000, with a corresponding reduction in borrowing powers. [This has been done.]

The Council have, the Committee say, on two previous occasions sought to impose their control as regards gas-testing—viz. in 1893 in the case of the Crystal Palace Gas Company, and in 1900 in the case of the Wandsworth, Wimbledon, and Epsom Gas Company. On both occasions Parliament refused to grant the desired powers. In the latter instance, the case for the Council was very much stronger than now; for at that time the whole of the Company's area was within the County of London, and the Wandsworth Board of Works (the testing authority) supported the Council's application. Now, however, the Wandsworth Gas Company form part of a large undertaking extending outside the county to Wimbledon and Epsom; and the efforts made to obtain the support of the Wandsworth Metropolitan Borough Council on this occasion have proved unsuccessful.

In these circumstances, the Committee have formed the opinion—in which the Public Control Committee reluctantly concur—that there is very little probability of the Council succeeding in securing the amendment to the Bill making the Council the testing authority; and the Council's opposition to the Bill has accordingly been withdrawn.

THE COMMITTEE ON SMOKE ABATEMENT.

Gas in Connection with Housing Schemes.

At a sitting at the Ministry of Health last Tuesday morning of the Departmental Committee on Smoke Abatement, some valuable evidence was given regarding the desirability of using gas, particularly in relation to the National Housing Schemes. The sitting was presided over by Lord Newton (the Chairman).

ON BEHALF OF THE BRITISH COMMERCIAL GAS ASSOCIATION.

Mr. F. W. GOODENOUGH, Executive Chairman and Vice-President of the British Commercial Gas Association, submitted evidence supplementary to that given by him in July, 1914, before the Committee who were at that time considering the matter, and whose sittings were interrupted by the outbreak of war.* The Association, he said, understand that the Committee are considering first of all whether it is practicable to provide smokeless heating and cooking arrangements for new working-class houses which it is hoped are going to be built in the near future. He referred to a memorandum issued by the Association last July, the main point of which was that, both from a national and from an individual standpoint, it is a sound proposition that gas should be largely used for fuel in the homes of the people, though it is not suggested that gas should be employed exclusively for fuel in working-class houses. In these dwellings the servant problem does not arise; and gas for a room where a fire is required constantly is more expensive than coal. But in consequence of its great cleanliness and labour-saving advantages, gas is exclusively used for heating in a large number of the better-class houses and flats in London. The Association suggest that the only place in any house where a solid-fuel fire is needed is in the living-room—in other words, one solid-fuel fire per house; and this fire can be used in conjunction with arrangements for cooking and water heating.

As to the relative cost of using gas or electricity for heating, the case is briefly that first of all from the national point of view, electricity as a source of heat entails the destruction of a great deal more coal than gas. To give the consumer the same amount of heat requires the destruction at the electricity generating station of approximately four times as much coal as when the heat is generated at a gas-works—besides the loss of the valuable bye-products which are recovered in the process of gas manufacture.

When it comes to lighting, from a coal conservation point of view there is practically nothing in the argument. The coal will produce approximately the same amount of light in each case. In reply to a question by a member of the Committee, witness said he agreed that the balance would be in favour of electricity, if one could use half-watt lamps for all purposes. The reason why he introduced any question of gas *versus* electricity was because the public have been led, by political speeches and by the newspapers, to believe that a new heaven and a new earth will result from the extended use of electricity for all domestic purposes. It is not a practical proposition; and his desire was to draw attention to the fact that it is necessary to look for smokeless cities in other directions than the extended use of electricity for heating, though there is a big field for it for power and lighting.

By the use of gas it is now practicable, at very reasonable cost, to secure a hot-water supply when the coal-fire is not in use. There have been suggestions made that hot water might be supplied to working-class houses from a central boiler; but this, again, is not a practical proposition, as it would entail enormous waste both of water and of heat. The Women's Housing Sub-Committee, in their final report, said: "We are convinced a central system would prove by far the most economical and satisfactory method; and we strongly recommend that

* See "JOURNAL," Vol. CXXVII., p. 117.

it should be installed wherever possible in the new housing schemes." He was afraid this report was adopted without any lengthy inquiry into the cost of a central system. A type of gas water heater which has recently been installed on an estate at Hendon has proved very satisfactory.

As bearing upon the popularity of gas for cooking, Mr. Goodenough pointed to the fact that the biggest demand upon gas-works in almost all parts of the country is between 11 and 1 o'clock on Sundays, when people—and the working classes especially—are cooking their dinner. Since he gave evidence in 1914, the number of gas appliances in use, both in working-class dwellings and other houses, has increased enormously. So far as he has been able to ascertain from a selection of gas undertakings in the principal towns of the country, the increase in the six years has been over 600,000 gas appliances for domestic purposes. This was striking evidence of the popularity of gas. Then he wished to emphasize the fact that all transfers of heating and cooking from crude coal to gas result in an economy in the use of coal. In other words, there is less coal destroyed to do the same work for the consumer if he uses gas, than if he burns coal in its crude form. It is estimated that 40 million tons of coal are now consumed in a raw condition for household purposes, and that, by using gas, 30 million tons net of coal only would be destroyed. When coal and gas rationing were under discussion, there were many arguments with the Coal Controller as to what was a fair average to take for gas against coal. In the first place, 15,000 c.ft. was fixed upon; but this was afterwards raised to 18,750 c.ft., as it was wished to encourage the use of gas for various reasons. In practice, in many cases, 10,000 c.ft. of gas will do the work of a ton of coal for cooking. His own fairly wide experience, dealing with 800,000 consumers, all pointed in the same direction—the use of gas for heating purposes is increasing by leaps and bounds. It is no uncommon thing for the Gas Light and Coke Company to instal twelve, twenty, or even more gas-fires in one house, and for them to stay there. They are doing it every day. The only difficulty at the present time is to get the necessary apparatus. His Company had a bigger increase in the output of gas last year than ever before—amounting to 4000 million c.ft.

By the use of gas, economy in building construction also can be secured. There is a substantial saving by the putting-in of flues adequate for gas-fires, but not sufficiently large for coal fires. Houses are now actually being constructed in this way; and a saving of at least £30 per house is calculated upon. Some of the houses are being built at Plymouth, to the designs of Mr. John Murray; and a block of offices is being erected in the City of London. The saving he mentioned is after allowing for one open fireplace per house. Gas-pipes should be put in new houses at the time of their construction, just as are water-pipes. At present-day prices, piping working-class dwellings while in course of erection should not cost more than £4 or £5; so that, by the new system of gas-flues there is a very big saving, even after allowing for the cost of putting-in the gas-pipes.

The Chairman: Is there such a thing as an odourless gas-fire?

Witness: If properly fixed, and there is sufficient ventilation, every gas-fire should be odourless. One ought not to know whether there is a coal-fire or a gas-fire in the room. After all, a coal-fire is really only a gas-fire—burning unpurified gas.

The Chairman: Very large numbers of these houses would be erected in localities where gas would not be available?

Witness: The greater proportion of housing schemes will be on the outskirts of towns where there is already a gas supply; and in other places, if needed, gas-works would soon be forthcoming. There are already over 1600 gas-works in the country; and every village of any considerable size is served.

Mr. E. D. Simon: What would be the cost of a gas-fire?

Witness: Such a fire as would be put into working-class houses, which would before the war have cost £1, would now perhaps cost £2 10s.; so that one would not be substituting a very much more expensive article for the ordinary coal fire. In putting the saving in construction at £30 per house, the extra cost of the apparatus had been taken into consideration. The Ministry of Health are already recognizing the importance of gas heating, by agreeing that under certain conditions gas-pipes should be run to two bedroom fire-places; and I am hoping they will agree that, where gas is put in at all for cooking, a supply should be run to the bedroom fire places while the houses are in course of construction. It is important the pipes should be put in while the houses are being built. The cost would be very little extra in this case.

Bailie Smith: What fuel do you suggest should be used for the one open fire?

Witness: Coal to light the fire, and then coke should be used; or you could have a gas-burner underneath to light the coke in the first place.

Bailie Smith: Is it not in certain circumstances to some extent economical to use electricity for heating?

Witness: Certainly not for working-class homes, and only to a limited degree is it a practical proposition anywhere.

Bailie Smith: Are you satisfied that gas-cookers are at their highest point of economy, or is there room for improvement?

Witness: There is room for improvement, and improvement is being made at the present time. The makers are very busy experimenting. My experience of the working classes is that they prefer gas to electric lighting, partly because artificial light is really required most of the time when heat is needed, and the gas gives off sufficient warmth to take away the chill from a room, and thus often saves a fire. It is our experience that gas lighting is cheaper than electricity.

Bailie Smith: Do you allow anything for decorating, cleaning, &c.?

Witness: The working-class tenant does not have to pay for that; and, anyway, ceilings require cleaning periodically from a sanitary point of view.

Bailie Smith: I want your reasons for saying that electric lighting is dearer than gas lighting. My experience is quite the opposite; and I want to find out where I am wrong.

Witness: I have not put in any evidence on that particular point, because I thought it would not be a question for the Committee to consider. But gas lighting is, light for light, several times cheaper than electricity.

Bailie Smith: Are the gas industry taking any precautions to educate their men better than they were educated some years ago?

Witness: My Company have a very thorough apprenticeship scheme in operation; and they have also classes, &c., for the older men.

Prof. Cohen asked witness some questions as to electricity compared with gas from a health point of view.

Bailie Smith: As to fully piping new houses, have you any method of sending far more gas from the works to the houses?

Witness: It seems to me this is a matter the gas undertakings ought to deal with right away. Every gas undertaking should be seriously considering its distribution problem, where there is likely to be any increase in consumption consequent upon housing schemes. For a fairly large supply of hot water, coke is to be recommended; but the use of this involves labour, and so many people prefer gas. For small houses such as are being considered now, the gas water-heater is a very practical and economical proposition. Depreciation of gas piping and fires is an absolutely insignificant matter.

Mr. Simon drew attention to the necessity for coke to be supplied in as dry a condition as possible.

Heating Efficiency of Open Grates Burning Solid Fuels.

Dr. Margaret White Fishenden, who was the next witness, placed before the Committee her views with regard to the heating efficiency of various designs of open grates burning solid fuels. Her evidence was to the effect that the total amount of radiation thrown into a room from a coal-fire burning in a modern barless grate was found to be equivalent to about 20 p.ct. of the calorific value of the coal burned. For a small old-fashioned register grate, the radiation emitted into the room was about 24 p.ct. of the calorific value of the coal burned. A similar result—24 p.ct. of the calorific value of the coal burned—was found for a large old-fashioned grate with curved bars. Diminution of the draught through the room (by means of fender and damper control) from 20,000 c.ft. to 2000 c.ft., or from about nine to one complete changes per hour, caused a reduction in the rate of combustion of the coal of about 50 p.ct.; the rate of emission of radiation being also reduced to about one-half. In other words, the radiation thrown out by the burning of equal weights of coal did not vary, over the limits investigated, with the rate of burning of the coal.

Dried gas coke was found to emit radiation equivalent to about 24½ p.ct. of the total heat of the coke burned in a small barless grate, as compared with 21 p.ct. for coal burning in the same grate. In a small register grate, the coke gave radiation equivalent to about 28½ p.ct. of the calorific value consumed, as compared with 24 p.ct. for coal burning under similar conditions in the same grate. The calorific value of the dry coke was about 13,000 B.Th.U. per pound, and that of the coal 14,500 B.Th.U. per pound; and it could easily be calculated that the coke gave, weight for weight, 4 or 5 p.ct. more radiation than the coal. As the moisture content of the coke increased, the radiant efficiency decreased; the diminution in the amount of radiation emitted being more than the equivalent of the heat required to vaporize the water present. For contents of more than about 10 p.ct. of water, the coke gave, weight for weight, less radiation than coal.

Low-temperature carbonization coke proved remarkably efficient as a radiating source; two samples giving as radiation, when dry, respectively 34 and 31 p.ct. radiant efficiency, as compared with 24 p ct. for coal burning in the same grate. The calorific value of these fuels was about 13,200 B.Th.U. per pound; and the radiation emitted was therefore some 25 p.ct. in excess of that emitted by an equal weight of coal of a calorific value of 14,500 B.Th.U. per pound. As in the case of gas coke, the radiant efficiency, of course, diminished as the moisture content of the fuel increased; but for the highest proportions of moisture met with—11 p.ct. by weight—the radiation emitted was still considerably in excess of that thrown out by an equal weight of coal. The fires made from low-temperature coke were bright and pleasant, and were free from both smoke and smell. They were lighted easily, and without the addition of any coal. These results suggest that coke, if put on the market dry—or especially low-temperature carbonization coke, if it could be produced at a reasonable price—should easily become a popular, as it is an efficient, fuel. Both have the additional advantage of being smokeless.

A typical good Welsh anthracite, of a calorific value of 14,400 B.Th.U. per pound, gave as radiation into the room 27 p.ct. of the calorific value consumed, as compared with 24 p.ct. for coal burning in the same grate under similar conditions.

Taking the case of a coal-fire burning with a high draught, it would appear that about 22 p.ct. of the heat of combustion is likely to appear as radiation, while the heat carried away by the air above the ceiling-level in the flue represents about 50 p.ct. of the heat of combustion, some of this energy having appeared originally as radiation. When the draught to the fire is reduced, the proportion of the heat which appears as radiation remains unaltered, and may again be taken as 22 p.ct. But the heat carried away by the air may be reduced to 15 p.ct. of the calorific value of the coal burned, leaving 35 p.ct. of the heat of combustion to be accounted for as compared with conditions of high draught. It appears likely that the greater part of this energy passes away by conduction through the flue-walls, which fact could be taken advantage of if all flues were built along inner walls. It must also be noted that the heating of the air of a room produced by open fires is very small, and that, as the air passing through the room is always considerably below body temperature, cooling and discomfort may be produced if the velocity of the draught is high. Draught regulation therefore becomes, for this reason also, a matter of paramount importance.

It must be clearly borne in mind that the householder will, almost without exception, be guided chiefly by considerations of financial economy. Taking the aggregate efficiency of a coal-fire in respect to the room which it is required to heat as 30 p.ct., that of a modern gas-fire as 60 p.ct., and that of the electric heater as 100 p.ct. of the energy consumed, it can readily be calculated that, with coal at 45s. per ton, gas at 4s. 3d. per 1000 c.ft., and electricity at 1d. per unit, the cost of a coal-fire for continuous heating is only about one-third that of a

gas-fire, or a fifth that of an electric heater of equal heating capacity. These figures, of course, vary directly with the price of the fuels; but on any scales likely to be met with, solid fuels have a decided economic advantage over gas, and especially over electricity, for continuous heating. In these circumstances, therefore, it follows that, regardless of the greater cleanliness of gas or electric heating, and (owing to the fact that they can be turned on or off at will) their special suitability for heating rooms which are used for short periods only, the householder, considering the immediate cost, will in the majority of cases continue to burn solid fuel until either legislation prevents him from doing so, or the prices of gas and electricity are substantially reduced. It becomes important, therefore, that attention should be directed to the possibilities of coke as a domestic fuel, and to the necessity of securing the greatest economy in the combustion of coal or coke in ordinary grates.

ALLIANCE AND DUBLIN CONSUMERS' GAS COMPANY.

Half-Yearly Meeting.

This Meeting was held in the Offices, D'Olier Street, Dublin, last Thursday—Mr. JOHN MURPHY presiding.

The CHAIRMAN, in moving the adoption of the report and accounts, said that though the margin of profit was small when compared with the total receipts, yet, in existing circumstances and the limitation placed on the dividend, the figures would not, he hoped, be regarded as unsatisfactory. One of the most gratifying features in the half-year's working was the substantial increase in the quantity of gas sold for all purposes, notwithstanding the advance of 6d. per 1000 c.ft. in the price, which they were compelled to make in September last. The total increase exceeded 64 million c.ft., of which about 35 millions was the additional quantity consumed through ordinary meters, while 27 millions represented the increased quantity sold to prepayment consumers—the remainder, 2 millions, being the increase in public lighting. Speaking generally, it might be said that practically every item of expenditure, both in respect of materials and labour, had advanced considerably, and while the total income was larger by about £43,000, the expenditure on revenue account had increased by no less than £49,000. As to the capital account, the outlay had substantially exceeded the credits, and they would find that, while the expenditure amounted to just over £10,000, the deductions only totalled £3761. This increase was almost entirely due to the encouraging fact that they had been obliged to expend over £6000 in providing new meters for additional consumers. Turning to the revenue account, the cost of coal and oil had advanced considerably when compared with the corresponding half year, owing to the rise of 6s. per ton on the former, which took place in July last. It had adversely affected them to the extent of £16,340. On the other hand, the increased receipts from coke and breeze amounted to more than this advance; so that really they had benefited to the extent of £1000. The receipts from tar were also larger by £2550, and there was a small increase in income from ammoniacal liquor and sulphate. All the other items relating to the manufacture of gas remained about the same, with the exception of repair and maintenance of works, which showed an increase of slightly over £8000 as compared with that of the corresponding period. In explanation of this, it had been found necessary, as previously mentioned, to increase the capacity of their coal-gas plant. About this time last year it was decided to place an order with West's Gas Improvement Company for a vertical retort installation at the City works. Consequently, the accounts for the half year under review had been charged with the appropriate proportion of the contract sum. The total expenditure on distribution, after deducting the profit realized on sales of gas-fittings, amounted during the half year to almost £35,000—an increase of over £5500. As a matter of fact, their expenditure on repairs of meters alone was larger by upwards of £10,000. Repairs to mains and services showed a decrease of £4700—principally because in the half year under review they were not called upon to renew any of their larger mains, as was the case in the corresponding period. In connection with the lighting and maintenance of public lamps a small profit had again been realized, which was satisfactory, as was also the decrease in the cost of rates and taxes, brought about by the reduction in their assessments. Management was up to the extent of £1000; but this was fully accounted for by the increase under the head of establishment charges. Under the heading of miscellaneous and special charges, the expenditure for law costs, bad debts, and discounts was down. On the other hand, however, the amount paid in war bonus to the Company's employees had increased from slightly over £17,000, in the corresponding half year, to almost £34,000—or, in other words, practically doubled. With regard to income, the net receipts for gas were higher by over £20,000, although only a very small proportion of this was due to the increase in price. The rental figures were also up, particularly the charges for prepayment meters and stoves, which again showed a satisfactory improvement. In the net revenue account, it would be seen that the bank interest paid had been reduced by one-half, although, owing to the larger amount of working capital now required, they anticipated that future charges under this head would be much heavier. After providing for this and debenture interest, and allowing for the credit on income-tax account, the dividend of £3 5s. 3d. per cent. could not be met without encroaching on the carry-forward to the extent of £2989. In consequence of the reduction in the price of coal, he was glad to announce that all household and domestic consumers would receive a rebate on their gas accounts for the March quarter of 7d. per 1000 c.ft. This rebate, although substantial, might have been larger were it not for the fact that the authorities had been unable to see their way to make an allowance on the part of the output where oil was substituted for coal in the manufacture of carburetted water gas. The Company, and indirectly the consumers, had derived great benefit from having acquired the two steamers *Ardri* and *Braedale*, which, during the past few years, had been profitably utilized for the conveyance of their coal. Both boats, however, had been many years afloat, and, early last year, it was considered desirable to build a steamer specially suited to the Company's needs, to take the place of the *Braedale*, which, as the market was favourable, they took the opportunity to dispose of. Satisfactory progress had been made with the new collier, and it was hoped that she would make her trial trip in May. On the advice of the Company's experts, it was decided not to proceed with the promotion of a Special Bill in view of the promised general legislation.

Mr. W. H. DAVIES, who seconded, said he was astonished to find that just at the moment the price of the Company's stock had gone down to £38—the lowest level yet reached. There was certainly nothing in the accounts to explain such a slump.

The motion was then passed unanimously.

The CHAIRMAN next moved that a dividend of £3 6s. 3d. p.ct. per annum (less income-tax) on the consolidated ordinary stock be declared; and this was agreed to.

The proceedings concluded with a vote of thanks to the Chairman, Directors, and staff.

STOKE-ON-TRENT GAS-WORKS AND BAD COAL.

Claim against the Controller.

At a Meeting of the Stoke-on-Trent Town Council last Thursday, the following report of the Gas Committee was adopted.

The Gas Committee received a report with reference to an interview by the Chairman, Vice-Chairman, and Engineer (Mr. A. Mackay) with the District Coal Committee, and an interview by the Engineer with the Coal Controller, concerning the supply of Durham coal to the gas-works. The Engineer also reported on the supplies of coal received this year, and the financial loss resulting therefrom. The Engineer stated that he proposed to make a claim against the Coal Controller in respect of the loss sustained by the Committee during the current financial year, amounting in the aggregate to £1572. It was resolved that the Engineer be authorized to make this claim.

Alderman A. Brookhouse (the Chairman of the Gas Committee) stated that the District Coal Committee appeared desirous of assisting the Corporation if they could. The deputation asked them to replace about 6000 tons of coal of which the gas-works were deprived by the Government's action in closing the Silverdale pits. They also asked that the coal should be obtained locally instead of from Durham or elsewhere. The District Coal Committee could not pledge themselves to this. The Engineer took with him some samples of the Durham coal; and though the Committee did not say much, it was clear that they condemned it emphatically as to quality. The October consignment of Durham coal cost 11s. 11d. per ton above the local price. A trainload received in January cost 14s. 10½d. per ton above the local price; and in March a load of really bad stuff cost 16s. 6d. per ton more than the local price. The Committee recommended that a claim for £1572 be made against the Coal Controller. Whether they would get it, was another matter. During the past year the extra charge over the previous year on the gas undertakings in respect of wages, coal, meters, cookers, and general requirements amounted to £30,156. This did not include increased railway charges, which for the twelve months commencing Jan. 15 last would cost an extra £1686. Practically a quarter of this came into the current year's accounts, representing over £400 as a dead-charge. The following figures showed the amounts of the increased charges for wages and coal at the four works:

	Wages.	Coal.
Burslem	£2637	£2611
Fenton	1596	4263
Longton	2676	4704
Stoke	1910	1947

The increased cost of coal was very much larger at Fenton and Longton than at the other works, because the Fenton and Longton works had had to have the Durham coal. These circumstances had made it difficult during the current year to adjust the price of gas so as to cover all the liabilities. To meet the extra cost, the price was increased from Oct. 1 last as follows: Burslem, from 2s. 9d. to 3s. per 1000 c.ft.; Fenton, 2s. 6d. to 3s. 4d.; Longton, 3s. 6d. to 3s. 11d.; Stoke, 3s. 6d. to 3s. 11d. The large increase of 10d. per 1000 c.ft. at Fenton was due to the renewal of a 12-in. main—about £5000 having to be found out of revenue. He was advised by the Engineer that, though at the present moment the price of gas was pressing upon Fenton a little heavily, the Fenton undertaking would be in a very good position in the near future. Since 1914, the price of gas had been increased by the following amounts: Burslem, 1s. 2d. per 1000 c ft.; Fenton, 1s. 6d.; Longton, 2s. 1d.; Stoke, 1s. 10d. Taking the four undertakings, the increase in the price of gas since the beginning of the war had been 86·75 p.ct. On the other side, the wages bill had increased by 145 p.ct., and other expenses from 150 to 300 p.ct. He did not think there was any cause for alarm; for he considered the undertakings had justified themselves.

Retford Gas Charges.—The Retford Gas Committee have decided that, in view of the increased railway rates, wages, and materials, the price of gas be advanced 4d. per 1000 c.ft., making it 4s. 8d., less 5 p.ct. discount for prompt payment.

Waste Heat and Gas Utilization.—The report of the Waste Heat and Gas Electrical Generating Stations, Ltd., for the year ended Jan. 31, states that the profit, after deducting administration expenses, was £39,626, less £13,500 transferred to the credit of the reserve fund account, leaving £26,126, to which must be added the balance brought forward, making available £43,463. The Directors recommend a dividend at the rate of 8 p.ct. for the year, carrying forward £17,863. The reserve account is now £113,851, including the amount transferred from the profits of the past year. The redemption funds in respect to plant supplied on hire-purchase terms amount to £15,651. There has been considerable delay in the delivery of the plant for the new power station at Horden; and it is not expected that it will be completed and ready for occupation until the middle of this year. The new generating plant at Weardale has been run satisfactorily; but it is not yet in continuous operation.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

London, *March* 29.

In the London market, pitch remains in a very strong position, and at least 120s. net per ton f.o.b. makers' works is easily obtainable. Creosote is also in strong demand, at about 1s. net per gallon in bulk. Benzol, toluol, and solvent naphtha remain unchanged. A largely increased production of anthracene is likely to be required; and, pending negotiations on the matter, the price is indefinite; although much higher than when business was last reported.

There is nothing new to record as to sulphate of ammonia.

Tar Products in the Provinces.

March 29.

The average values for gas-works products during the week were: Gas-works coal tar, 71s. 6d. to 76s. 6d. Pitch, East Coast, 115s. to 120s. per ton f.a.s.; West Coast—Manchester, 112s. 6d. to 117s. dd.; Liverpool, 112s. 6d. to 117s. 6d.; Clyde, 117s. 6d. to 120s. nominal. Benzol 90 p.ct. North, 2s. 3d. to 2s. 4d.; crude 65 p.ct. at 120° C., 1s. 5d. to 1s. 7d. naked at makers' works; 50-90 p.ct. naked, North, 2s. 2d. to 2s. 4d. Toluol, naked, North, 2s. 6d. to 2s. 7d. nominal. Coal tar crude naphtha in bulk, North, 10d. to 10½d. Solvent naphtha, naked, North, 3s. 3d. to 3s. 4d. Heavy naphtha, North, 3s. 3d. to 3s. 4d. Creosote, in bulk, North, liquid, 10½d. to 10⅝d.; salty, 7d. to 7½d. Heavy oils, in bulk, North, 11½d. to 1s. Carbolic acid, 60 p.ct., 3s. 3d. to 3s. 6d. Naphthalene, £23 to £30; salts, £7 10s. to £8 10s., bags included. Anthracene, "A" quality, 7½d. to 8d. per minimum 40 p.ct.; "B" quality, nominal.

FROM A MARKET CORRESPONDENT.

Tar Products.

The market for all products remains exceedingly strong, and, high as prices are, there seems every likelihood that the upward movement will be carried further. The greatest interest still centres in pitch, of which many of the northern makers now have no stocks; while others are receiving over £6 per ton f.o.b. for prompt delivery. London prices are practically equivalent to those prevailing on both coasts. It is difficult to find sellers; and buyers are in no mood to quibble about price. The current high range of values is due quite as much to the home demand as to that from abroad. There is nothing fresh in naphthas; but naphthalenes are in good request. Ball naphthalene is about 45s. per cwt., refined flake is difficult to fix, and crude is about as it was a week ago. Creosote continues to exhibit exceptional strength, and some extraordinary prices are being mentioned. In the North, probably very little could be bought under 1s. 1d.; and it is difficult to see how creosote used as fuel can be worth so much. Carbolic acids are well maintained. In spite of tempting offers, there is very little crude 60's available. There is not much crystal on the market, notwithstanding the fact that export prices are being withheld. Moderate business is being done in cresylic acid. The position in benzol is unchanged; but there is obviously no prospect of lower prices. The market in intermediates is nominally without change. Supplies remain extremely scarce; and the shipments now coming to hand from America have so far done nothing to relieve the situation.

Latest quotations are as follows:

Benzol: 90% London 2s. 4d. to 2s. 5d., North 2s. 3d. to 2s. 4d.; 50-90% 2s. 2d. to 2s. 3d. London, 2s. 1d. to 2s. 2d. North; crude 60-65%, 1s. 5d. to 1s. 7d.; pure, 3s. per gallon naked.

Crude Tar: London, 62s. 6d. to 67s. 6d.; Midlands, 58s. to 65s.; North, 57s. to 62s. 6d. per ton *ex* works. Refined tar, 44s. per barrel (free) on rail.

Pitch: London, 125s. per ton; East Coast, 125s. to 130s. per ton; West Coast, 115s. to 130s., with Manchester 125s. per ton, and Glasgow 120s. per ton; South Wales, 125s. per ton.

Solvent Naphtha: London, 3s. 9d. Provinces average 3s. 8d. per gallon.

Crude Naphtha: Naked, 10d.; North, 9d. per gallon.

Heavy Naphtha: 3s. 4d. per gallon.

Naphthalene: Refined, £25 per ton nominal; crude, £9 to £16 10s., according to quality.

Toluol: Naked, 2s. 9d. per gallon nominal. North, 2s. 7d. Pure, 3s.

Creosote: London, 1s. 0½d. to 1s. 1d.; North, 1s.; heavy oil, 10½d. per gallon in bulk.

Anthracene: 40-45%, 9d. per unit per cwt.

Grease Oils: 18° Tw. (naked), £6 10s. per ton f.o.r. makers' works.

Aniline Oil: 1s. 7d. to 1s. 8d. per lb., drums free.

Cresylic Acid: 95%, 4s. to 4s. 6d.; 97-99%, 4s. 3d. to 4s. 9d. per gallon *ex* works London, f.o.b. other ports.

Carbolic Acid: Crude 60%, 4s. per gallon; crystals 40%, 1s. 3d. to 1s. 4d. per lb.

Sulphate of Ammonia.

Export values have risen considerably of late, and now leave prices for home consumption at a great discount. Makers, however, cannot take much advantage of this so long as their outputs cannot be largely augmented. The opinion obtains that, in consequences of the further increase in manufacturing costs, the terms at which home users are drawing supplies should be raised again owing to high figures being paid for export. The new French synthetic process is stated to possess very definite advantages in contrast with the Haber system. France evidently aims at complete independence, and every assistance is to be given in the development of the native invention if satisfactory results continue to be achieved.

USE Simmance's

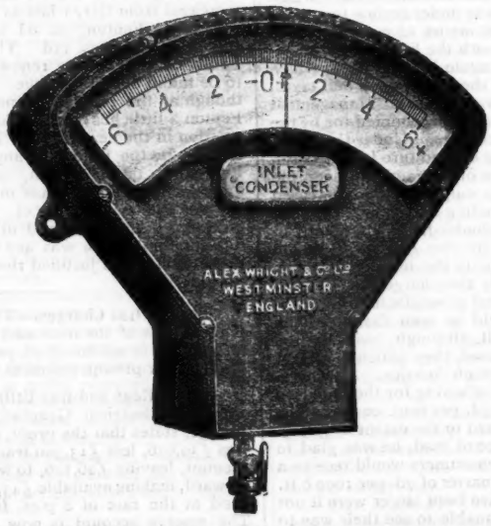
DEAD BEAT INDICATORS

instead of WATER-TUBE GAUGES and

"READ THE PRESSURE BY THE POINTER."

No liquid to evaporate and no levels to adjust.

No glasses to break and nothing to clean.



Direct reading, Open scale, Any range (Pressure, Vacuum, or Combination).

Incorrodible, Accurate, for foul or purified gas.

MADE IN MANY RANGES WITH TABLETS LETTERED AS DESIRED.

ALEXANDER WRIGHT & CO., LTD., WESTMINSTER.

Agents: Australia—FYVIE & STEWART, 360, Collins St., Melbourne; Canada—W. P. ROPER, 502, Merchants' Bank Building, Montreal.

Yorktown and Blackwater Gas Company.—It was reported at the annual meeting of the Company that, as compared with 1918, the sales of gas last year showed an increase of nearly 5 million cubic feet. After paying all charges, there remained a balance of £7943, out of which dividends were declared (including the interim payments) of 7½ p.ct. on the original shares and £5 8s. 6d. p.ct. on the old and additional shares, all less income-tax. The year was described as a fairly successful one in the face of great difficulties.

Skegness Gas Loan.—The Derbyshire Miners' Association, which have large accumulated funds, have come to the help of the Skegness District Council, by lending £44,200 in connection with the purchase of the local gas undertaking, remunerative results of the working of which, entertained previous to its acquisition, have not been realized. The Executive of the Association have indicated that they will be pleased to consider favourably future applications of a like nature from the authorities, in preference to those from other public bodies, as they have considerable financial interests in the town.

The Coal Position.—The "Iron and Coal Trades Review" says: A heavy tonnage of gas fuels is being commandeered—particularly for the larger works; and their reserves are at a far more satisfactory level to-day than at one time seemed possible. The position of reserves at many of the smaller works shows little change; they have only a few days' supply in sight. The operation of "daylight saving" will bring about a further substantial reduction in gas consumption for domestic purposes, which should enable stocks to be increased at a steady rate. Stocks at many electricity works are at very low levels; and although the Coal Controller's Departments have been pressing collieries to give larger deliveries, very little headway has been made in the direction of building-up reserves. In view of the serious shortage of coal which still exists, District Coal Supply Committees have instructed collieries to give preference during the present week to household coal and public utility orders over industrial orders.

Australian Gas Light Company.—It was reported by the Directors at a special general meeting held in Sydney last month that the profits for the half year ended Dec. 31, including the balance brought forward, amounted to £87,329. The dividend recommended at the rate of 4 p.ct. on the "A" and "B" shares would absorb £73,200, and leave a balance to be carried forward of £14,129. Owing to causes beyond the Board's control, the operations of the Company have been considerably interfered with, and are reflected to a certain extent in the reduced credit at profit and loss as compared with the corresponding half of the previous year. Among the difficulties encountered was the substantial increase in wages granted by the Federal Arbitration Court, and ante-dated to March 6, 1919. The retrospective pay amounted to £18,396, and was borne wholly by the past half year. An application was made to increase the price of gas to 5s. 1d. per 1000 c.ft., which was granted. This, however, could not be brought into operation until Jan. 1 of the present year. In these circumstances, the contribution allocated to the special purposes fund has not been anything like commensurate with that of previous periods.

Melbourne Metropolitan Gas Company.—The report which was presented at the half-yearly meeting in January of the Metropolitan Gas Company of Melbourne stated that the profits for the six months ended Dec. 31 amounted to £49,143, to which had to be added a sum of £77,735 brought forward, making a total of £126,878. After transferring £10,000 to the reserve fund, the Directors recommended a dividend of 6s. 6d. per share, requiring £65,000, and leaving a balance of £51,878 to be carried forward. The recent maritime strike, together with the consequent restrictions on the use of gas during the half year, meant a considerable reduction in consumption, and involved additional expenditure. This, combined with a reduction in the returns from sulphate of ammonia, rendered it necessary, as indicated by the figures, to draw upon the balance brought forward from the previous half year to the extent of £25,856 to pay the ordinary dividend.

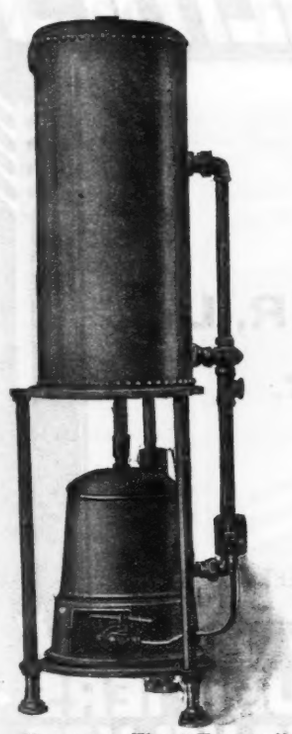
Messrs. A. & W. Richards have placed at par the whole of the 7 p.ct. redeemable debenture stock which they lately offered on behalf of the Directors of the Lea Bridge District Gas Company.

In the columns of the "Brighton Herald" a hundred years ago, the inhabitants were "respectfully informed that the Brighton Gas Light and Coke Company, having now completed the works, are ready to supply them with any number of lights."

At a special meeting of the Galashiels Town Council it was decided to instal an automatic system of street lighting. The capital outlay is put at £1300; and the figures show a probable annual saving, as compared with the present system, of £125. The Town Council of Arbroath have requested the Lighting Inspector to report on various systems of automatic gas lighting.

The Chairman of the Worksop Gas Company (Mr. H. Bannister), in presenting the Directors' report at the annual meeting, referred to the loss the Company had sustained by the resignations of Mr. T. Morris, who had been Chairman for 45 years, and Mr. John Jones, who had served on the Board for 25 years. The report and accounts were considered most satisfactory; and the ordinary dividends were declared.

At Spennymoor last Tuesday, the Weardale Steel, Coal, and Coke Company, Ltd., were fined £50 for insufficient safeguard and protection of electric wires at their bye-product ovens at the Tudhoe works, whereby George Copeland met his death by coming in contact with a live wire. It was stated that the body of Copeland was found at the doorway of the sulphate house, his hand clutching a live wire. The opinion was expressed that he had picked-up the wire to remove it to one side, as it had blown down across the doorway. Mr. William Shand, Electrical Engineer to the Company, said the wire was put up in the ordinary way. There was no cradle underneath. The wires had been in the same condition for twelve years; and no complaint had been made until the accident occurred.



No. 424. The "Energy."
Stands can be supplied to any desired height.

The "Main"
Circulating Water Heater.

THIS Gas Heater is constructed throughout of strong cast iron with corrugated inner and outer jackets giving an unprecedented heating surface. The gases, after heating the inner jacket, are drawn to the base, and to reach the flue outlet must travel over the outer casing, thus utilising the heat to the utmost.

A really efficient thermostat is fitted; and the heat-retaining outside casing is made of steel, porcelain enamelled, giving the heater a most attractive appearance.

A sample will convince you of its efficiency.

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WORKS: Gothic Works, EDMONTON, N.18; Gothic Ironworks, FALKIRK; and Gothic Works, BIRMINGHAM.

SHOW-ROOMS AND BRANCHES: 25, Princes Street, Oxford Circus, W.1; 82, Gordon Street, GLASGOW; 18, Severn Street, Deansgate, MANCHESTER; 97, Millfield, BELFAST; 6, Narrow Wine Street, BRISTOL; 333, Queen Street, MELBOURNE.

Economy Urged at Harrogate.—Owing to the poor supply of coal, the Harrogate Gas Company found themselves last Tuesday with only four days' stock. While every effort was being made through the Coal Controller and other sources to get more coal, an urgent call was issued to consumers for economy in the use of gas.

Spenborough and Bradford Arbitration.—The Spenborough District Council are preparing to go to arbitration, under the Act of 1914, in the matter of the failure of the Bradford Corporation to come to an understanding with the Spenborough Gas Committee in reference to the suggested purchase of a Bradford gas undertaking within the Spenborough area.

Maryborough (Queensland) Gas Supply.—The report for the past half year of the Maryborough (Queensland) Gas and Coke Company, Ltd., states that the profits, after making provision for renewals, depreciation, working expenses, bad debts, and all other charges (including the balance brought forward) amounts to £1282. From this the Directors recommended payment of the usual dividend of 6 p.ct. per annum (free of income-tax), amounting to £1237, and leaving £45 to be carried forward.

Neath Gas Provisional Order.—Mr. Harold E. Byrne, on behalf of the Ministry of Health, held an inquiry at Neath last Wednesday into the application of the Neath Corporation for a Provisional Order for the sanction of a loan to carry out alterations in connection with the gas-works, estimated to amount to £34,000. There were present the Chairman of the Gas Committee (Alderman Hopkin Morgan), the Town Clerk (Mr. I E. Curtis), and the Gas Manager (Mr. W. Clarke Jackson), who explained the scheme in detail.

Minehead Gas Light and Coke Company.—The report which was adopted at the annual meeting stated that, in the exceptional circumstances prevailing, the year ended Dec. 31 might be regarded as satisfactory. The net profit was £1277; and with the amount brought forward, there was, after deduction of income-tax and interest, a balance available to distribute of £2634. A dividend of 6 p.ct., free of tax, was declared, leaving £1674 to be carried forward. The Chairman (Mr. James Phillips) said that, while other undertakings had been running short of coal, their stocks at Minehead had always been sufficient for five or six weeks at least.

Potteries Station of the British Gas Light Company.—Under the heading of "British Gas Light Company's Undertaking," a paragraph in the report of the Gas Committee submitted at last week's meeting of the Stoke-on-Trent Town Council stated that a special meeting of the Committee had been arranged "to further consider the question of the proposed concentration of the manufacture of gas for the district." Mr. Sproston asked whether this was a proposal for combining the British Gas Light Company's undertaking with the Corporation's undertakings; and the Chairman of the Gas Committee replied that it was. The Mayor said a report of the special meeting of the Gas Committee on the question would come before the next meeting of the Council.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official List" for March 24.]

Nos. 7589—8368.

Anderson, J.—"Prepayment mechanism." No. 8223.
Anderson, J.—"Dry gas-meters, &c." No. 8224.
Banks, W.—"Circulating gas-water heater." No. 8027.
Bean, O. U.—"Method of producing gas." No. 8256.
Billington, W. J.—"Geysers, &c." No. 8292.
Chowning Regulator Corporation.—"Controllers for gas-producer regulators." No. 7955.
Cutler, A. H.—"Gas burner for heating liquids." No. 7659.
Dombrowski, D.—"Boxes for mantles, &c." No. 8121.
Fisher, S.—"Device for indicating the flow of liquid in pipes." No. 8342.
Haddan, R.—See Chowning. No. 7955.
Hislop, J. H.—"Fuel." No. 7783.
Hodgson, J. L.—"Rotary fluid-meters." No. 8154.
Legge, W. H.—"Burners." No. 8248.
Lyne, F. T.—See Banks. No. 8027.
Marlow, J. H.—"Gas-fired ovens or kilns for tiles, pottery, &c." No. 8037.
Pfeifer, B. R.—"Production of gas, &c." No. 8327.
Poppe, E.—"Utilization of combustion gases of brick, &c., ovens, and process for manufacture of sulphurous products." No. 7998.
Roberts, H. W.—See Cutler. No. 7659.
Shakeshaft, A. & C. E. M.—"Incandescent gas-mantles." No. 7774.
Stephenson, A.—See Banks. No. 8027.
Williams, P. E.—"Manufacture of gas-purifying material." No. 8279.

Dublin Gas-Workers' Wages.—Negotiations are proceeding between the Alliance and Dublin Gas Consumers' Company and their employees' union regarding a demand for an increase in wages of 11s. a week. The Company have made an offer, and it is under consideration.

New Plant for Seaton.—Shareholders of the Seaton Gas Company met on the 26th inst., when Mr. C. F. Gosney (the Chairman) submitted the report and balance-sheet relating to what he described as a difficult and trying year. The time had come, he said, when the price of gas must be increased to enable the Company to pay their way. An advance to 7s. per 1000 c ft. was proposed, and 8s. for slot-meters. The Directors intended to instal a new plant, which would give a much better return, and, he hoped, bring the price down again. The net profit of the year was only £176; and the Directors recommended a dividend of 2½ p.ct., compared with 5 p.ct. last year. The shareholders approved the report and accounts.

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Its five simple cast-iron parts are manufactured and fitted with engineering precision. All heating surfaces are vertical—there are no complicated parts to trouble the maintenance department. Send for copies of our new Folder No. 2265 for distribution to all your consumers now, and invite them to inspect a sample "IRONCLAD" in your Showrooms.

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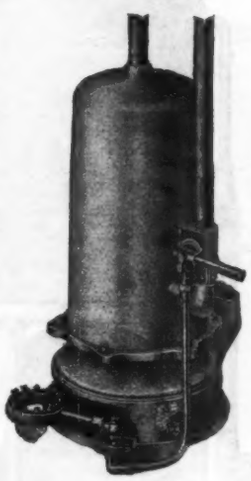
The Richmond Gas Stove & Meter Co., Ltd.



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With Thermostat, and Burner swung out ready for lighting.

The FIVE PARTS of the IRONCLAD.

DURABLE YEAR . . . AFTER . . YEAR. . . .

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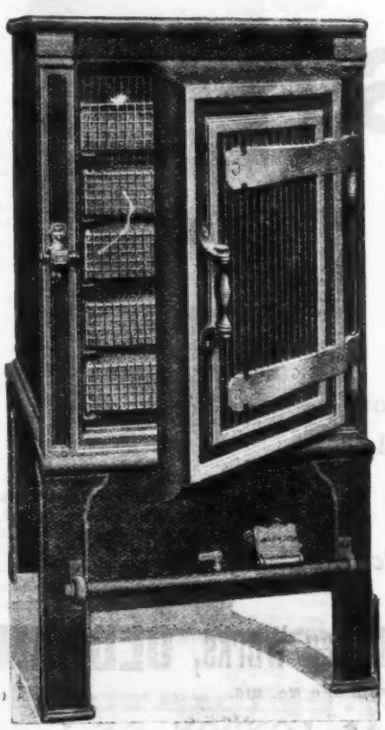
Wilson "Premier" Low Pressure Steamer



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IT IS FITTED WITH FIVE GALVANIZED WIRE TRAYS.

THE STEAM IS RAISED BY AN ATMOSPHERIC GAS BURNER UNDER THE WATER TROUGH.

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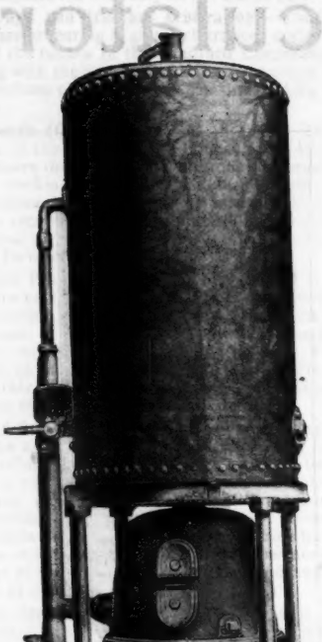

"ACMEFONT" Builders' Set

A COMBINED HOT-WATER CIRCULATOR AND STORAGE TANK - GAS-HEATED.

Fitted with a patent "Thermostat" which automatically controls the gas consumption, and with an "Economy" valve which enables the full storage capacity or five gallons only to be in circulation at once. When supplied for hard water districts the interior of the Boiler is treated with a special "Noncrust" preparation which prevents lime deposits adhering in hard immovable lumps to the internal metal parts.

Storage capacity: 10, 20, 30, or 40 gallons.

Supplied on high or low stands.

ARDEN HILL & CO.,
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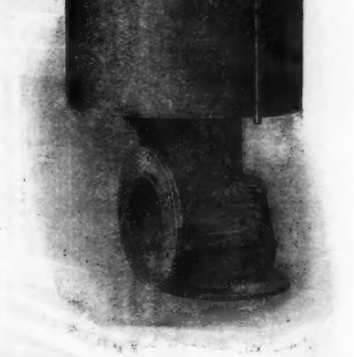
BRADDOCK'S RETORT-HOUSE GOVERNORS

HAVE PROVED TO BE
SECOND TO NONE.

Many repeat orders have been received.

Braddock's New Patent Retort-House Governor is a further improvement and is especially desirable for use with Vertical Retorts.



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Braddock's New Patent Enclosed Retort-House Governor. Latest Type.

Further Particulars upon Application.

J. & J. BRADDOCK (BRANCH OF METERS LIMITED), **Globe Meter Works, OLDHAM.**

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The Glasgow Corporation Gas Department have agreed to a recommendation by a Sub-Committee to appoint for the head office staff of their chemical works department an engineer at a salary of £365 per annum, *plus* £135 bonus.

The Danish Ministry of Justice have published a proclamation extending the existing export prohibition in respect of ammoniacal and potash salts so as to cover all alkalies, including soda, potash, and ammoniacal water; all salts of ammonia, soda, and potash, such as potash fertilizer, chloride of lime, and saltpetre.

The twenty-fifth annual report of Messrs. Gibbons Bros. (Dudley), Ltd., dealing with the twelve months ended Dec. 31, states that the net profit for the year, after providing for excess profits and depreciation, is £31,020, which, added to the amount brought forward, makes a total of £35,424. Of this, £11,844 has been placed to the reserve fund. Out of the sum available the Directors recommend a dividend of 5½ p.ct. per annum, free of income-tax, upon the ordinary capital, which, with the interim dividends already paid, will make a total of 12½ p.ct. for the year.

STOCK MARKET REPORT.

THINGS on the Stock Exchange have notoriously been very dull for some time past; but last week they went from bad to even worse. There was hardly a firm spot to be found in any market; the public standing stubbornly aloof and declining to buy. Even attractive new issues were less warmly received, and in some cases underwriters found themselves left with considerable balances of their commitments. Happily, at the close the tendency was not at its worst.

In the gilt-edged market, Home Government issues made themselves conspicuous by furnishing a hitherto inconceivable record for Consols, which on Wednesday reached the mark of 45. A slight reaction later made Friday's price a bit better—viz., Consols 45¼ 46, War Loan 87½-87⅞, Funding 66¾-68¼, Victory 76-76¾. Home Rails were very dull, though the labour outlook looked less gloomy at the close. Canadians and Argentines did fairly at first, but fell away.

The Foreign Market was in evil case; the vagaries of Exchange being very unsettling indeed.

In the Miscellaneous Market, there was almost universal depression, and the old favourites were quite in the cold—*e.g.*, Rubber, Oil, Iron and Steel, Shipping, Nitrates, Textiles, and Insurance.

Business in the Gas Market was on a somewhat reduced scale as compared with that of the preceding week—a feature not to be wondered at, seeing how deadly quiet business was in all Stock Markets in general. And, thus lacking support, the tendency was for prices to give way. In the London Companies, Gas Light and Coke and South Metropolitan Ordinaries were put down to a 53-56 level. Commercial did not move. Suburban and Provincial were little affected. In Continentals, Imperials receded 5, and Europeans ½. Cape Town and Oriental both advanced; while Primitivas were not much dealt in, and the preference fell ½.

Bargains done for cash during the week were as follows: On Monday, Commercial 4 p.ct. 54½, ditto 3½ p.ct. 49½, European 7¼, Gas Light ordinary 55, 55⅛, 56½, Hongkong and China 9½, Imperial Continental 128½, 129, 131½, Monte Video 74⅜, 75, Oriental 105, Primitiva 28s. 9d., 31s. 3d., ditto preference 55s., 57s. 6d., ditto debenture 70½, River Plate 51. On Tuesday, Bournemouth preference 8⅜, Gas Light ordinary 54½, 55, ditto preference 58½, 59½, Imperial Continental 130, Primitiva 31s. 3d., South Metropolitan 56½, 57, 58¼, Tottenham "B" 48, Barnet "A" 137, ditto "C" 137, ditto "D" 102. On Wednesday, Bournemouth "B" 9⅜, British debenture 53, Gas Light ordinary 54, 55⅜, ditto preference 58⅜, Imperial Continental 128, South Metropolitan 55⅛, 55⅜, 56, 56¼, 56½. On Thursday, Brentford "A" 45, Commercial 3½ p.ct. 52½, Cape Town preference 6½, Gas Light ordinary 54, ditto preference 57⅞, ditto debenture 49¼, 49½, Imperial Continental 125, 126, 127, Oriental 104½, Primitiva 30s., South Metropolitan 54, 55¼, South Shields 103½, Tynemouth 73. On Friday, Brentford "A" 46, Gas Light ordinary 53, 53¼, 53½, 54, 55, Imperial Continental 125, 126, 127, Primitiva preference 51s. 3d. South Metropolitan 53, 53¼, 54.

In the Money Market, the usual demand at the end of the quarter set in; but as apprehension as to stringency subsided, so rates in general became easier. Silver was very irregular. The Bank rate is 6 p.ct., as fixed on Nov. 6, 1919.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S BARGAINS.

Issue £	Share	When last Dividend	Ante-War Dividend & Bonus. p.c.	Last Dividend.	NAME	Closing Prices, July 30, 1914.	Present Prices.	Lowest and Highest Prices of Bargains.
183,049	Stk	Mar. 11	4	4%	Aldershot 4 p.c. Pref.	..	38–43	..
1,551,868	,,	Mar. 26	2½	3⅛%	Alliance & Dublin Ord.	59–64	41–46*	..
874,000	,,	Jan. 15	4	4%	Do. 4 p.c. Deb.	76–79	61–63	..
380,000	5	Oct. 30	7½	6%	Bombay, Ltd.	5½–6	5–5½	..
50,000	10	Feb. 26	15	10%	Bournemouth Gas and Water { 10 p.c. B 7 p.c. Pref. 5 p.c. 4 p.c. Deb.	20–30	8½–9	..
888,110	10	,,	7	7%		15–15½	9–10	9⅜
115,000	10	,,	5	5%		13½–14	8½–9	8⅝
162,065	—	Dec. 30	—	4%		..	6½–6⅝	..
999,045	Stk.	Feb. 12	14	30/-	Brentford A Consolid.	361–365	45–50	45–46
734,920	,,	,,	11	26/8	Do. B New	204–209	40–45	..
55,000	,,	,,	5	5%	Do. 5 p.c. Pref.	109–111	74–76	..
221,400	,,	Dec. 11	4	4%	Do. 4 p.c. Deb.	91–93	64–66	..
214,775	,,	Mar. 11	11	7½%	Brighton & Hove Orig.	205–218	121–126	..
244,900	,,	,,	8	5⅓%	Do. A Ord. Stk.	154–159	89–87	..
1,287,500	Stk.	Feb. 26	5	5%	Bristol 5 p.c. max.	..	..	..
680,000	20	Sept. 26	12½	10%	British	44–48	25–27	..
190,000	Stk	Dec. 30	4	4%	Do. 4 p.c. Deb. Stk.	58–60	59–61	55
245,771	,,	,,	4	4%	Buenos Aires 4 p.c. Deb.	86–87	47–50	..
100,000	10	—	—	—	Cape Town & Dis., Ltd	1¼–2½	7½–7⅝	..
100,000	10	Oct. 30	—	4½%	Do. 4½ p.c. Pref.	4–6	6½–7	6½
100,000	Stk.	Dec. 30	4½	4½%	Do. 4½ p.c. Deb. Stk.	70–76	58–63	..
157,150	,,	Feb. 26	5	5%	Chester 5 p.c. Ord.	108–110	..	..
1,613,380	,,	Feb. 26	6/9/4	33 4	Commercial 4 p.c. Stk.	106–108	54–59	54½
660,000	,,	,,	5½	26/8	Do. 3½ p.c. do.	108–108	50 –55	49½–52½
476,000	,,	Dec. 11	3	3%	Do. 3 p.c. Deb. Stk.	69½–71½	49–51	..
500,000	,,	,,	4	—	Continental Union Ltd.	76–79	27–32	..
200,000	,,	,,	7	—	Do. 7 p.c. Pref.	115–118	40 –50	..
51,600	Stk.	Feb. 26	14½	10⅓%	Croydon A 10 p.c.	..	130–140	..
278,400	—	,,	11½	7⅔%	Croydon B and C 7 p.c.	..	90–100	..
492,275	Stk.	,,	6	5⅓%	Derby Con. Stk.	125–135	..	..
55,000	,,	—	4	4%	Do. Deb. Stk.	102–104	..	..
1,002,180	10	Jan. 29	10	5/0	European, Ltd.	17½–18	7–9	..
16,295,975	Stk.	Feb. 12	4/17/4	30/-	Gas { 4 p.c. Ord.	98–102	53–56	53–55½
3,600,000	,,	,,	9½	26/8	Light { 3½ p.c. max.	76–79	40 –45	..
4,062,235	,,	,,	4	4%	and { 4 p.c. Con. Pref.	96–99	57–60	57⅝–59½
4,274,560	,,	Dec. 11	3	3%	Coke { 3 p.c. Con. Deb.	72½–74½	49–51	49½–49¾
180,000	,,	,,	10	10%	10 p.c. Bonds	..	..	..
82,500	,,	Mar. 11	5	3⅓%	Hastings & St. L. 5 p.c.	..	55–60	..
263,740	,,	,,	3½	2⅓%	Do. 3½ p.c	37–39	33–43	..
70,000	10	April 29	11	7%	Hongkong & China, Ltd.	10½–16½	8½–9½	9½
86,000	Stk.	Mar. 11	9	6⅓%	Horsley 7 p.c.	..	88–93	..
131,000	,,	,,	7½	5⅓%	Ilford A and C.	151–154	86 –91	..
65,780	,,	,,	6½	4⅓%	Do. B.	115–118	65–70	..
35,600	,,	Dec. 30	4	4%	Do. 4 p.c. Deb.	92–94	59–63	..
1,940,000	,,	May 14	9	4½%	Imperial Continental	150–160	125 –130	125–131½
1,998,000	,,	Feb. 12	9½	3⅔%	Do 3½ p.c Deb. Red	84–86	80–85	..
985,949	,,	Mar. 26	9½	5⅓%	Lea Bridge Ord. 5 p.c.	119–121	86 –91*	..
4,498,995	,,	Feb. 26	10	37/6	Liverpool 5 p.c. Ord. { A B	211 –212 146–149	..	..
806,088	,,	June 26	4	4%	Do 4 p.c. Pr. Deb. Stk	..	..	..
186,786	,,	Feb. 26	7/5/6	3⅔%	Maidstone 5 p.c.	..	52 57	..
16,000	5	June 11	5	5%	Malta & Mediterranean	4½–4¾	1½–2½	..
250,000	100	Oct. 1	4½	4½%	Met. of Melbourne { 4½ p.c. Deb.	99–101	90 –97	..
841,980	Stk.	Nov. 27	4	5%	Monte Video, Ltd.	11½–13	72 –77	74½–75
1,875,895	,,	Feb. 26	4½	3⅔%	Newcastle&Gateh'dCon.	98½–99½	63½ 64½	..
332,765	,,	Dec. 30	5½	5⅔%	Do. 3½ p.c. Deb.	62–68	55 –57	..
15,000	10	Mar. 11	—	8⅔%	North Middlesex 10 p.c.	..	18 –18½	..
55,940	10	,,	7/14/0	6⅔%	,, ,, 7 p.c.	14–15	8½–9½	..
800,000	Stk.	Nov. 27	8	5⅓%	Oriental, Ltd.	117–122	103–106	104½–105
60,000	5	Mar. 26	10	1/-	Ottoman, Ltd.	7½–7¾	4½–5½	..
60,000	50	Mar. 11	12	7½%	Pertuca, Island B	128–131	66 71	..
100,000	50	,,	12	6⅔%	Do. C	118–121	53–58	..
249,989	5	April 29	5	—	Primitiva Ord.	5½–6	1½–1⅔	28/9—31/3
499,960	5	June 26	5	—	Do. 5 p.c. Pref.	4½–5	2½–3	51/3—57/6
891,600	100	Dec. 1	4	4%	Do. 4 p.c. Deb.	91–93	70 –72	70½
600,000	Stk.	Jan. 29	4	4%	Do. ,, ,, 1911	..	48–51	..
946,198	,,	Dec. 30	4	4%	River Plate 4 p.c. Deb.	85–87	47–50	51
150,000	10	Mar. 26	5	5/-	San Paulo { 6 p.c. Pref.	10½–11	7½–7⅝*	..
125,000	50	Dec. 30	5	5%	{ 5 p.c. Deb.	41–42	39–41	..
185,000	Stk.	Mar. 11	10	50/-	Sheffield A	228–234	68–73	..
209,984	,,	,,	10	4½%	Do. B	232–234	68–73	..
528,500	,,	,,	10	35/5	Do. C	230–233	68–73	..
133,201	Stk.	Sept. 12	4	4%	Shrewsbury 5 p.c.	..	..	..
90,000	10	Oct. 15	2	10%	South African.	10½–11½	12–13	..
6,609,895	Stk.	Feb. 12	5/4/0	30/-	South Met. 4 p.c. Ord.	111–113	53–56	53–53½
250,000	,,	Jan. 15	—	5%	Do. Pref.	..	93–95	..
1,895,445	,,	,,	8	8%	Do. 3 p.c. Deb.	72½–74½	49 –51	..
294,890	,,	Feb. 23	3½	3⅓%	South Shields Con. Stk.	154–160	103–104	103½
1,087,795	,,	Aug. 14	6	3⅔%	S'th Suburb'n Ord. 5 p.c.	114–116	66 –71	..
247,558	Stk	Dec. 30	5	5%	Do 5 p.c. Deb. Stk.	116–118	78 –83	..
647,740	,,	Nov. 18	7½	3⅔%	Southampton Ord.	99–102	61–63	..
131,275	,,	Dec. 30	4	4%	Do. 4 p.c. Deb. Stk.	..	61–63	..
120,000	,,	Aug. 14	—	3⅔%	Tottenham { A 5 p.c.	135–138	68–73	..
789,275	,,	,,	6	2⅔%	District { B 3½ p.c.	115–117	48–53	48
181,255	,,	Dec. 11	4	4%	{ 4 p.c. Deb.	87–89	63–65	..
182,880	10	Dec. 30	5	—	Tuscan, Ltd.	6–8	1–2	..
149,900	10	July 1	5	5%	Do. 5 p.c. Deb. Red.	93–95	45–50	..
286,476	Stk.	Mar. 11	5	3⅔%	Tynemouth 5 p.c. max.	108½–109	72–74	73
80,000	,,	Feb. 26	8⅔	55/-	Wandsworth, Wimbledon, and Epsom— Wandsworth A 5 p.c.	151–158	83 88	..
256,638	,,	,,	6⅔	40/-	Do. B 3½ p.c.	129–134	61–66	..
108,075	,,	,,	—	38/6	Do. C	..	61–66	..
140,865	,,	,,	—	38/6	New Ordinary	..	61–66	..
852,000	,,	,,	6⅔	38/9	Wimbledon 5 p.c.	117–122	63–68	..
98,000	,,	,,	6⅔	40/-	Epsom 5 p.c.	121–126	63–68	..
88,416	,,	Dec. 30	3	3%	5 p.c. Deb. Stk.	58–60	48–50	49½

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Compiled and noted by JACQUES ABADY, of the Middle Temple, Barrister-at-Law.
LONDON: WALTER KING, "JOURNAL" OFFICES, 11, BOLT COURT, FLEET STREET, E.C. 4.

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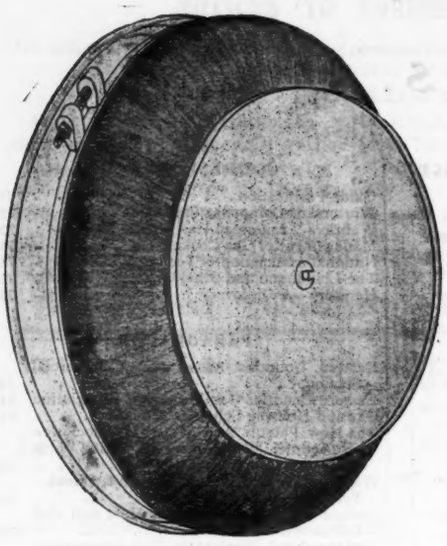

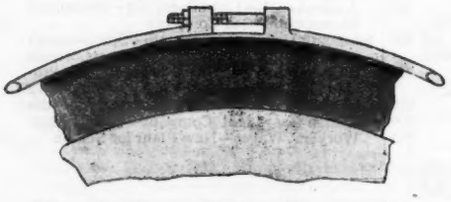

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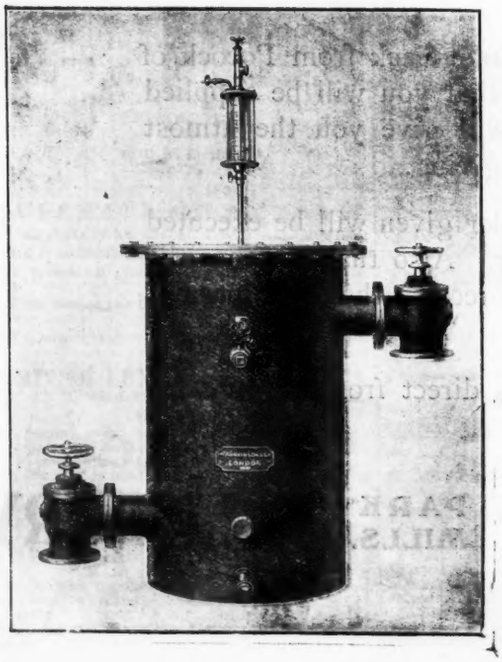

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GAS JOURNAL

LIGHT • HEAT • POWER • BYE-PRODUCTS

[Founded in 1849 as the "Journal of Gas Lighting."]

VOL. CXLIX. No. 2968.] LONDON, MARCH 30, 1920. [72ND YEAR. PRICE 8d.

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BEST AND UNVARYING QUALITY.

CREOSOTE & CARBOLIC OILS. NAPHTHALENES.

BENZOL PRODUCTS:

Pure 90's and Standard Benzol. — Pure and Commercial Toluol. — Light and Heavy Solvents.
65 per cent. Crude Benzol.

MOTOR BENZOL

in large or small quantities. Best Quality and Efficient Service.

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CONCENTRATED AMMONIA. MURIATE OF AMMONIA.

SIMON-CARVES LTD., MANCHESTER.

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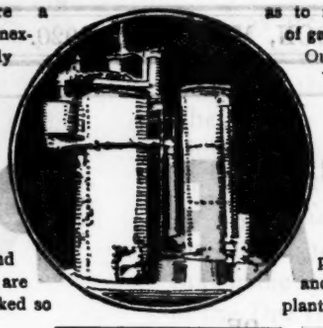
A special combined plant

WE manufacture a compact and inexpensive plant specially suitable for small works of an annual output of 50,000,000 c. ft. or under. All the advantages of the ordinary form of our apparatus are embodied in this plant, and all valves and gearing are arranged and interlocked so as to render the operation of gasmaking most simple. Our standard sized Water-Gas Plants (Blue or Carburetted) range from 50,000 c. ft. per day to 1,250,000 c. ft. per day. The actual space occupied by a 50,000 c. ft. plant is 7 ft. by 5 ft.; and by a 1,000,000 c. ft. plant is 22 ft. by 23 ft.



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"JEFFREY" WAGON & TRUCK LOADER

FROM GROUND TO WAGON IN ONE OPERATION.

30 TO 50 TONS PER HOUR.

HANDLE LUMPS AS WELL AS FINES.

PETROL OR ELECTRIC.

SELF PROPELLING & COLLAPSIBLE FOR TRAVELLING.

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UNEQUALLED FOR OUTDOOR LIGHTING

EFFICIENT
RELIABLE
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W 659. 1-LIGHT.
Length overall 18 in.
Diameter of reflector 15 in.

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Length overall 25 in.
Diameter of reflector 21 in.

W 657 with 2 burners.
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FITTED WITH PARABOLIC REFLECTOR.

SPECIAL FEATURES.

THE WELSBACH GLADIATOR OUTDOOR LAMPS ARE SUPPLIED IN 1, 2, OR 3-LIGHT AND ARE FITTED WITH ANGLE INVERTED BURNERS.

EACH LAMP HAS OUTSIDE GAS AND AIR ADJUSTMENT.

THE CASINGS ARE MADE OF FINEST STEEL AND ENAMELLED IN DARK GREEN.

FITTED WITH FLASH BY-PASS.

NO INNER GLASSES ARE REQUIRED.

WELSBACH

British Made

GLADIATOR LAMPS

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PATENT HYDRAULIC MACHINERY

FOR

CHARGING & DISCHARGING GAS RETORTS

Complete Hydraulic Stoking Plant Installations.

Plans and Estimates Furnished on Application.

HYDRAULIC CHARGING MACHINE

WILL EFFICIENTLY CHARGE RETORT IN LESS THAN ONE MINUTE.

Large Numbers of these Machines in use by the Principal Gas Companies throughout the Country.

For Full Particulars Apply:—

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SIR WILLIAM ARROL & CO., LTD.,
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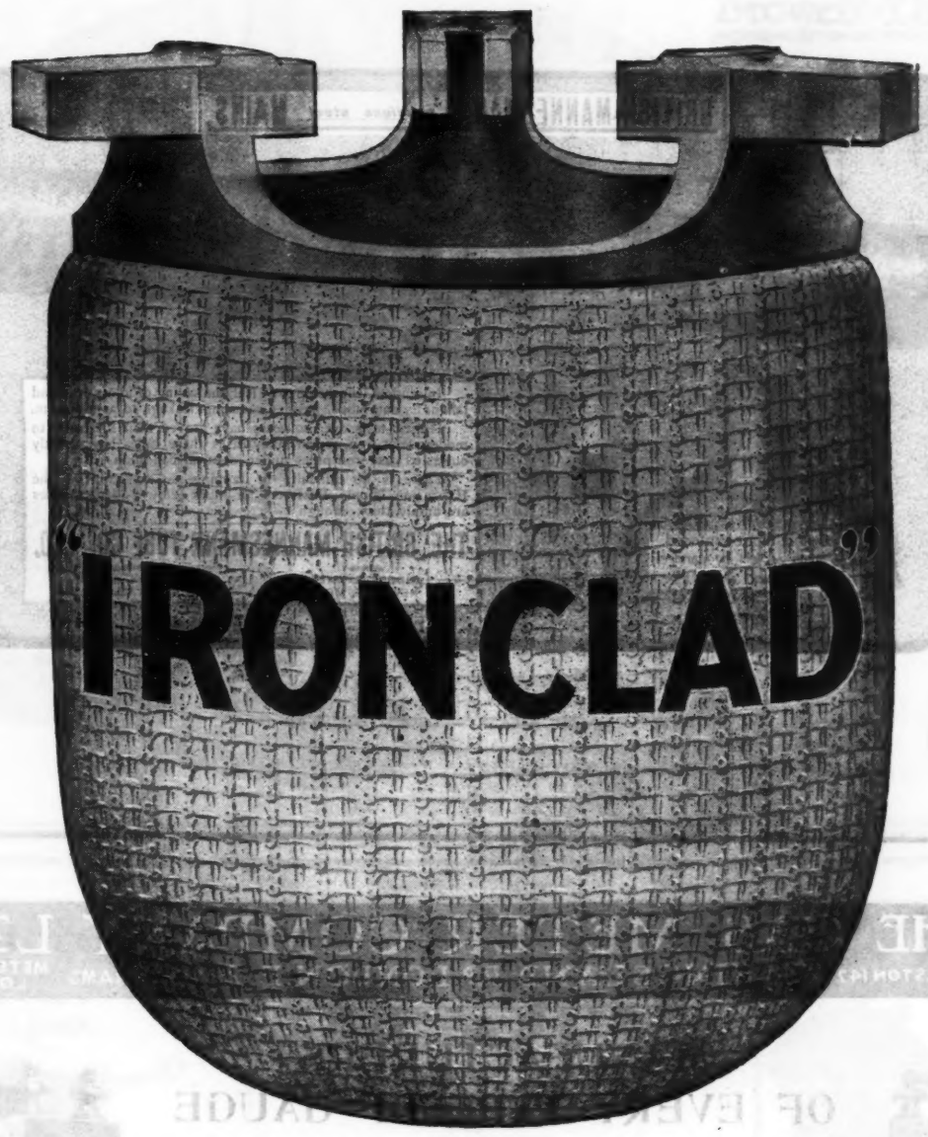

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Gas Mantles of every description,
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The Largest Manufacturers of Gas Mantles in the British Empire.

BRITISH-MANNESMANN weldless steel MAINS.
Showing nipple expanded into main, as left by mandrel. Jute wrapping undisturbed
In random lengths up to 45 feet, the saving of joints, lead and labour is enormous, besides reducing leakage to a minimum.
Drastic tests over 20 years have proved their life equal to modern cast iron, and in many cases these tubes have greatly outlasted cast iron pipes under identical conditions.
There is no difficulty in tapping—we recommend the Expansion Nipple illustrated for tubes below 5", larger tubes are amply thick enough to screw service pipe in direct.
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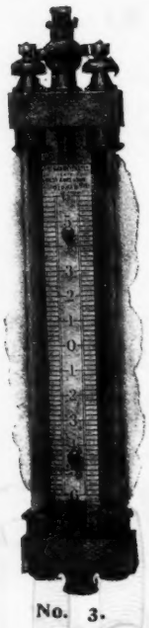

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Best Workmanship and Perfect Accuracy Guaranteed.

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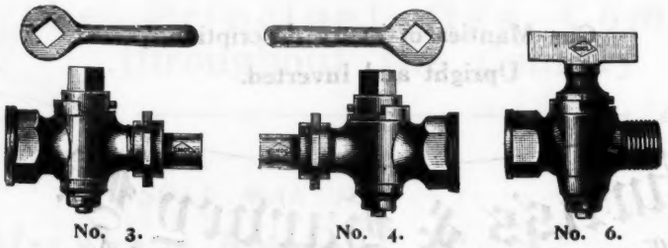

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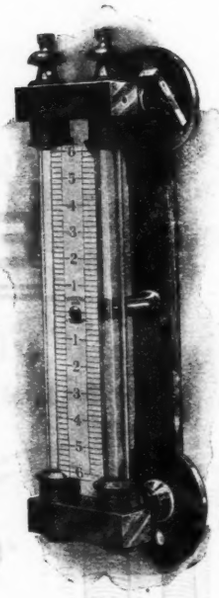

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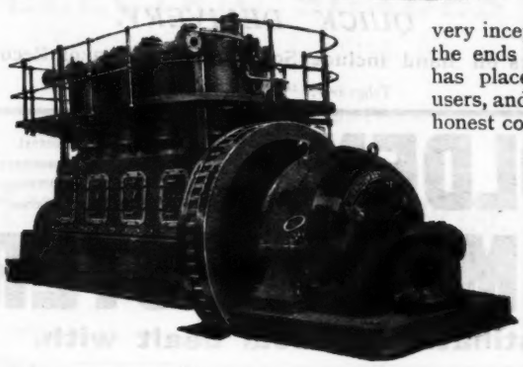

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Gas Engines

If you could visit our Works and see our Gas Engines in course of construction — inspect the materials—see the completed Engines under test — you would realise that the reliability of the Browett-Lindley Gas Engines is not a matter of mere chance. Reliability is the keynote from the very inception—service to the users and absence of breakdown, the ends which we keep constantly in view. This reliability has placed our engines high in the repute of experienced users, and the many repeat orders prove that our policy of simple, honest construction is one which makes for general satisfaction.

Send for our List of Users — it includes some of the Largest Firms in the Country.

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Sandon Works: PATRICROFT, Manchester
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The Well-known "SILVA" LAMP.

New Type Outdoor Pattern with Super-Heater.

1 to 16 Burners.

Also made for Indoor Use.

"GLASMI" - Gas Mantles -

"Still the Best" FOR ALL PURPOSES.

"GLASMI."

The Most Efficient Inverted Burner made.

THE NEW "ALBANY" 300 C.P. LAMP.

Vitrified Green Enamelled, with gold lines.

SMALL BRASS FITTINGS OF EVERY DESCRIPTION.

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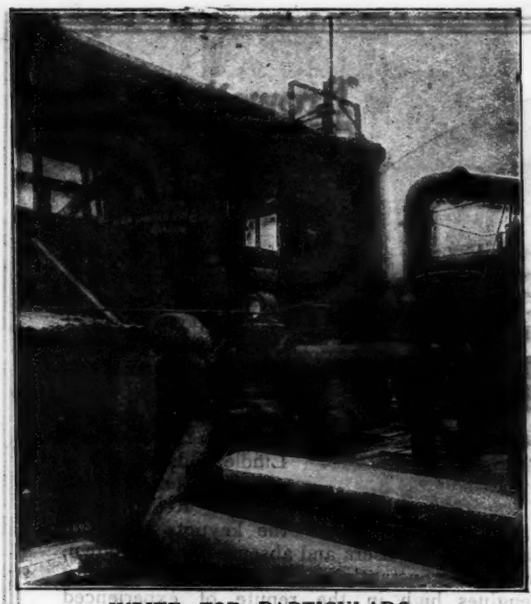

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BLAIR, CAMPBELL & McLEAN LTD.

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Centrifugal Scrubbers

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Revolutionises existing methods of Benzol, Ammonia, and Cyanogen Recovery.

Actual photo. of Battery treating 90,000 c. ft. of Gas per hour, recovering all Ammonia and Oils from same with 95 per cent. Efficiency. Only 10 feet × 4 feet dia. for above duty, and costs about half compared with other types.

QUICK DELIVERY.

Orders on hand include Scrubbers for Benzol Recovery

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All Bye-Products from the Distillation of Coal dealt with.

SPECIALITIES Carburetting Benzol, Benzol Absorbing Oil for Coke-Oven Plants, Toluol, Solvent, Heavy, and Burning Naphthas, Pyridine Bases, Carbolic Acid and Cresylic Acid, Soluble Disinfecting Fluid, Creosote, Fuel and Lucigen Oils, Black Varnish, Dipping Blacks, Prepared Tar for Asphalting, and for Road Treatment, Timber Creosoted for the Trade, &c. *See our Advertisement next week.*

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Telegraphic Address: "ORME, OLDHAM."
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IMPROVED PATENT COIN

PREPAYMENT GAS-METERS

FITTED WITH DETACHABLE ATTACHMENTS.

ARRANGED FOR 1d., 6d., 1s., OR ANY OTHER COIN DESIRED.

These Meters are giving Universal Satisfaction wherever adopted.

LIGHTING
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INVERTED & UPRIGHT
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HALF ENAMEL AND CLEAR
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PRICES ON APPLICATION.

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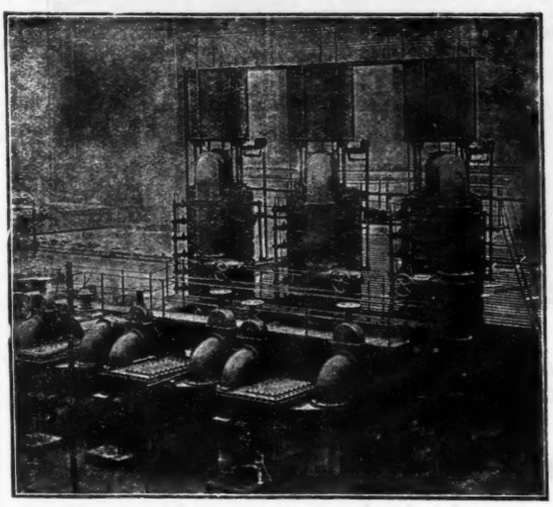
Telegrams: "LIGHTING, WOLVERHAMPTON." Telephone No. 1067.



Patent "Standard" Centrifugal Washers
For Extraction of Ammonia, Toluol, Cyanide, Benzol, Naphthalene, &c., from Coal and Other Gases.
Patent "Standard" Centrifugal Washers (and "Standard" Tar Washers) at the Southall Station of the Brentford Gas Company.
Total Daily Capacity of machines ordered: 234,170,000 cubic feet.
KIRKHAM, HULETT, & CHANDLER, LTD.
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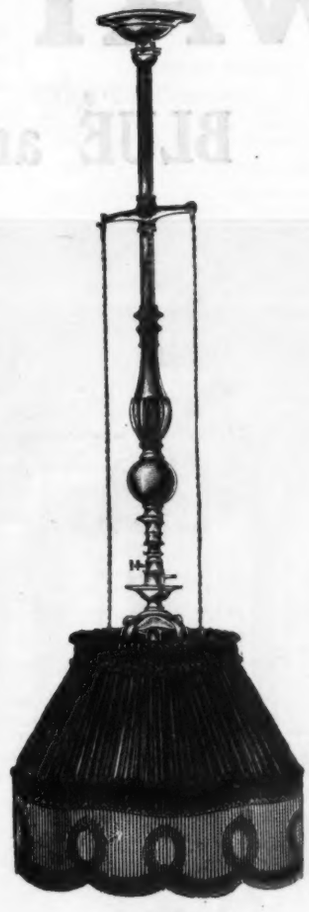
Telegraphic Address—"WASHER, ESTRAND, LONDON." Telephone No. 1843 CITY.

Falk, Stadelmann, & Co. Ltd.
VERITAS LIGHT WORKS
LONDON GLASGOW MANCHESTER



½-in. Down Rod.
G 30122
Polished.
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Oxidized Copper finish.

This fitting is representative of a complete new range of patterns at present available from stock.

Particularly serviceable for Lounge Halls and Dining Rooms.

High-Class finish and best workmanship.

Special attention and quotations given for lighting fixtures and supplies required in the New Housing Schemes.

Catalogue displaying a variety of designs sent upon application.

WATER GAS

BLUE and CARBURETTED.

Operating Floor of a Humphreys-Glasgow Blue-Water-Gas Plant constructed for the British Government. Capacity, 9 Million cubic ft. per diem.

Plants Complete and in hand for GOVERNMENT, aggregating a total capacity of over 50,000,000 cubic ft. daily.

555 Sets of Humphreys-Glasgow Plant have been (and are being) installed with a capacity of over 368,400,000 cubic ft. of Water Gas per diem. Including the work of their American Colleagues, 1427 Sets have been constructed with a total daily capacity of 1,146,300,000 cubic feet.

HUMPHREYS & GLASGOW, LTD.

38, Victoria Street, London, S.W. 1.

ROBERT DEMPSTER & SONS, Ltd., ELLAND, Gas Engineers and Contractors for CARBONIZING PLANTS on Horizontal or Vertical Principles, and Stoking Machinery. HANDLING INSTALLATIONS, including Coal Breaking, Elevating, Conveying Plants and Coke Screening, Storing and Telpherage Plants. PURIFICATION.—All Branches of Wet and Dry Purification. STORAGE.—Gasholders, and all forms of Gas Apparatus. Wire: "DEMPSTER, ELLAND." 'Phones: ELLAND 261, 262, 263.

MUNICIPALITY OF SINGAPORE, STRAITS SETTLEMENTS.

ASSISTANT GAS ENGINEER.

THE Municipal Commissioners of Singapore require an ASSISTANT GAS ENGINEER (age 25 to 35), of sound Constitution and Unmarried. He must have had a good Technical Education, a Regular Training as a Gas Engineer, with general All-Round Experience, including Carbonizing Machinery, both in the Design and in the Construction of new works and in ordinary Maintenance and in Distribution. The Appointment will be on agreement for three years with possible extension. The selected Candidate must pass a Medical Examination as to his Fitness for Service in a Tropical Climate. A Second-Class Passage will be provided by Mail Steamer, or a First-Class passage by other Steamer, with Half Salary during the voyage out. The Salary will be 4680 Dollars for the first, 4980 Dollars for the second, and 5280 Dollars for the third year, with a Duty Allowance of 720 dollars per annum, all paid monthly; the Value of the Dollar being two shillings and fourpence sterling. For the first Year the Salary would be equal to £690 as above, with an allowance for such transport as may be required on duty. Free Unfurnished Quarters will be provided in addition.

Applications, stating Age and place of birth, and giving Details of Education, Training, and Experience generally, and in Carbonizing Machinery, and stating when free, accompanied by *copies* only of Testimonials, and also personal References, to be lodged with Messrs. C. C. LINDSAY & PEIRCE, M.M.Inst.C.E., 180, Hope Street, GLASGOW, Agents to the Municipal Commissioners (from whom further Information may be obtained), not later than Saturday, April 3, 1920.

ESTIMATING Draughtsman for Large Constructional Works in the Midlands. Knowledge of Gas-Works and Coke Oven Plant useful but not essential.

Apply, by letter, stating Age, Experience, and Salary required, &c., to No. 6873, care of Mr. KING, 11, Bolt Court, FLEET STREET, E.C. 4.

WANTED—An Energetic and Reliable CARBONIZING FOREMAN for Shift Work, with Experience of Regenerator Settings, Electrical Stoking Machinery, Sulphate Plant, and General Gas-Works Routine.

Apply, giving Age, Experience, and Wages required, to the ENGINEER AND MANAGER, Gas-Works, NEW BARNET, Herts.

WANTED.—An Experienced Retort HOUSE FOREMAN. Eight-Hour Shifts. Wages, £5 per Week.

State Age and Qualifications, with Reference, to WILLIAM CHEW, Gas Engineer, BLACKPOOL.

PLANT, &c., FOR SALE & WANTED

MACHINE TOOLS FOR IMMEDIATE DELIVERY.

CAPSTAN and Turret Lathes—
One, as new, 1 in. Dreses, Capstan LATHE.
One Second-Hand 1¼ in. Foster TURRET LATHE, with Pump.
Two New 1¼ in. Cincinnati Acme CAPSTAN LATHES, with Pump.
One Second-Hand 1 in. Pratt & Whitney CAPSTAN LATHE.
Five new Wells Wire Feed CAPSTAN LATHES, ⅝ in. Collet, ⅞ in. Hollow Spindle.
Six Second-Hand, good condition, Herbert No. 9 TURRET LATHES. Single Pulley Drive, All-Geared Head (without Cross-Slides).

Centre Lathes—
Three new 9½ in. by 8 ft. straight Bed S.S.S. and Sc. Willson LATHES, with Chuck Steel Turret, Pump.
Four, as new, 9½ in. by 10 ft. straight bed S.S.S. and Sc. New Haven LATHES, 5 ft. 6 in. between Centres.
Three, as new, 8½ in. by 8 ft. Gap Bed S.S.S. and Sc. LATHES, by Summerscales, with Pump.
Two, as new, 9½ in. by 8 ft. straight Bed, Sliding and Surfacing LATHES, by Denham.
Four Second-Hand, good condition, 8½ in. by 8 ft. straight Bed S.S.S. and Sc. LATHES, by Dean Smith & Grace, with pump.

Boring Lathes—
One, as new, 26 in. swing Boring and Surfacing LATHE, by Darling & Sellers, with Hexagon Turret, 8 ft. Bed.
One new 32 in. swing Richards type Boring LATHE.

Grinders—
One new Brown & Sharpe No. 14 Plain GRINDER, capacity 12 in. by 30 in. complete.
One new 8½ in. Magnetic Chuck Ring GRINDER, with Pump.
Two New Universal Tool and Cutter GRINDERS.
Two, as new, 20 in. by 2 in. Wet TOOL GRINDERS.
One new Dumore Portable ELECTRIC GRINDER.

Millers—
One, as new, Profile MILLING MACHINE, table 16 in. by 30 in.
One Second-Hand No. 2 Becker Vertical MILLERS.
One new Baker No. 1 KEYSEATER complete.
Three new No. 5 All-Geared Cincinnati Plain Horizontal MILLERS.
Full Particulars on application to—
THE JUDSON-JACKSON COMPANY, LTD., 50, MARSHAM STREET, WESTMINSTER, LONDON, S.W. 1.

FOR SALE—One Gallaway Boiler, 7 ft. diameter by 26 ft. long, with Hodkinson's Mechanical Stoker Gear, Safety Valve, High Steam and Low-Water Safety Valves, 5 in. Junction Valve, two Feed-Water Inlets with Valves, Blow-Down Parallel Slide Valve, Two Gauge Glass Fittings and Pressure Gauge, installed 1915. Had very little use, insured 100 lbs. W.P.

H. WYVER, Gas-Works, WHITSTABLE.

THE Cardiff Gas Light and Coke COMPANY OFFER for SALE COMPRESSED AIR and STOKING MACHINERY by Messrs. West's Gas Improvement Company, Limited, Manchester, comprising:—
One 2-Stage AIR COMPRESSOR.
Two Compressed Air SCOOP CHARGING MACHINES.
Two Compressed Air RAKE DRAWING MACHINES.
One SIMULTANEOUS CHARGING and DISCHARGING MACHINE.

These Machines are in good running order, well equipped with spare parts, and may be seen in action at the Grangetown Gas-Works, Cardiff.

Latest date for receipt of offers, April 19.

GEORGE CLARRY,
General Manager and Secretary.

GAS Plant for Sale.—Prompt Delivery.
CONDENSERS.—Sets of 10-in. and 8-in. dia. Pipe Condensers.
EXHAUSTERS.—B lt driven and Combined with STEAM ENGINES.
PURIFIERS.—Set of Three, 9 ft. Square. Splendid Boxes.
WASHERS.—Holmes BRUSH-WASHER, 250,000 c.ft. per Hour.
FIRTH BLAKELEY, SONS, & Co., LTD., CHURCH FENTON, *via* LEEDS.

GASHOLDER and Steel Tank, 2000 c.ft. Capacity, never used.
FIRTH BLAKELEY, SONS, & Co., LTD., CHURCH FENTON, *via* LEEDS.

WANTED.—Two 24 in. Four Way Dry-Faced Gas Valves. New preferred; Second-Hand will have consideration.
Apply to ED. COCKEY & SONS, LTD., FROME.

CONTRACTS OPEN.

HARROGATE GAS COMPANY.

TO TAR DISTILLERS.

THE Directors invite Tenders for the Purchase of the SURPLUS CRUDE TAR produced at their Works.

Full Particulars may be obtained on Application to the undersigned.

FRANK H. ROBINSON,
Assoc M.Inst.C.E.,
Engineer and Manager.

Gas Offices,
James Street,
Harrogate,
March 27, 1920.

MANCHESTER CORPORATION.

(GAS DEPARTMENT.)

THE Gas Committee are prepared to receive TENDERS for the CONSTRUCTION and ERECTION of Two RETORT HOUSES and VERTICAL RETORT INSTALLATIONS on the Continuous System, COAL and COKE HANDLING PLANT, &c., &c., at their Bradford Road Station.

Specification and Form of Tender may be had on Application to the Superintendent, Gas Department, Town Hall, on payment of Two Guineas, which will be returned on receipt of a *bona fide* Tender.

The General Plan of Works may be inspected, and permission to view the Site and any other information obtained, on Application to Mr. W. Newbigging, Engineer, at his office, 5, Norfolk Street, Manchester.

Sealed Tenders, in official envelope, addressed to the Chairman of the Gas Committee and endorsed "Vertical Retort Installation," Bradford Road Station, to be Delivered at the Gas Offices, Town Hall, Manchester, not later than 5 p.m. on Thursday, the 6th of May, 1920.

The Gas Committee do not bind themselves to accept the lowest or any Tender.

By order,
THOMAS HUDSON,
Town Clerk.

Town Hall, Manchester,
March 26, 1920.

MANCHESTER CORPORATION.

(GAS DEPARTMENT.)

NEW OXIDE AND SPENT OXIDE.

THE Gas Committee are prepared to receive TENDERS for the Supply and Delivery of about 2000 Tons of NEW OXIDE OF IRON required during the ensuing Twelve Months for Purification of Gas at their several Gas Stations.

Tenders are also invited for the Purchase from the Corporation of the available SPENT OXIDE, on the Basis of the Contents of Sulphur and Blue, and for the RE-SALE to the Corporation of such Spent Oxide after Extraction of Blue.

The Form of Tender may be had on Application to the Superintendent, Gas Department, Town Hall, Manchester, and Tenders, endorsed "New and Spent Oxide," should be addressed to the Chairman of the Gas Committee not later than 5 p.m. on Thursday, the 8th of April, 1920.

By order,
THOMAS HUDSON,
Town Clerk.

Town Hall, Manchester,
March 27, 1920.

BIRSTALL URBAN DISTRICT COUNCIL.

(GAS DEPARTMENT.)

THE Gas Committee of the above Council invite TENDERS for the RESETTING of Twelve RETORTS in a Through Arch at the Council's Gas-Works.

Further Particulars and Specification may be obtained from Mr. Rufus Ellis, Engineer and Manager, Gas-Works, Birstall, near Leeds.

Tenders, endorsed "Resetting Retorts," must be sent to the undersigned not later than 10 a.m. on Saturday, the 10th day of April, 1920.

HORACE GRAY,
Clerk to the Council.

Council Offices,
Birstall, near Leeds.

CITY OF BELFAST.

THE Gas Committee of the Belfast Corporation invite TENDERS for the Supply Delivery, and Erection of the following:—
One STATION METER to pass 300,000 c.ft. per hour.
Two Sets of EXHAUSTERS, each of a Capacity of 250,000 c.ft. per hour.

Specifications and Drawings may be obtained from Mr. J. D. Smith, M.Inst.C.E., Engineer and Manager, Gas-Works, Ormeau Road.

Tenders, endorsed "Tender for Station Meter," or "Tender for Exhausters," should be lodged in the Office of the Undersigned not later than the 8th of April, 1920.

A Tender, if sent by post, must be Registered; if Delivered by hand, an Official Receipt must be obtained for it, otherwise the Undersigned will not be responsible.

The Lowest or any Tender not necessarily accepted.

R. MEYER,
Town Clerk.

SAVE MONEY
BY DRIVING YOUR AUXILIARY PLANT ELECTRICALLY
I have special experience in this work, and my services are at your disposal.
W. T. WARDALE, A.M.Inst.E.E. 13, The Drive, Maricliffe Road, SHEFFIELD.

KENYON'S PATENT OIL FILTER and WATER SEPARATOR
Over 900 ordered by H. M. Government.
ENGINEERS' STORES, TOOLS.
ALEXANDER KENYON & CO., LTD., Victoria Bridge, MANCHESTER.

HOUSE'S
JOINTING MASTIC FOR all Gas & Steam Joints. Flange or Screw. Any pressure.
'VULCAN' SCOTCH CEMENT FOR Jointing Sectional Tanks, &c.
In Tins and Casks.
HOUSE & CO., 68, Falkner Street, LIVERPOOL.

KOPPERS' PATENT CHAMBER OVENS.
Results obtained which have never been Surpassed by any other System of Carbonization.
Plants at Work and under Construction for the production of **70,000,000** cubic feet of Gas per Day.
See our large Advertisement appearing in alternate issues of the "JOURNAL."
The KOPPERS' COKE OVEN AND BYE-PRODUCT CO., 301, Glossop Road, SHEFFIELD.

THOS. DUXBURY & Co.
16, Deansgate, Manchester.
Specialists in Gas Coal and Cannel.
COKE MERCHANTS.
Telegrams: "Darwinian, Manchester." Telephone: 8268 and 8269 City.

TROTTER, HAINES, & CORBETT, LIMITED.
BRETTELL'S ESTATE,
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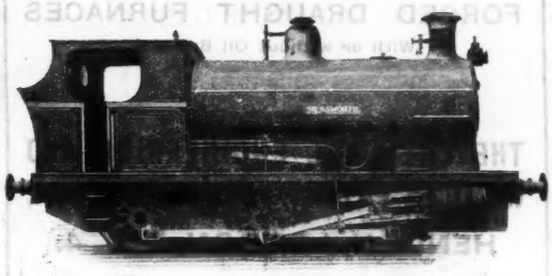

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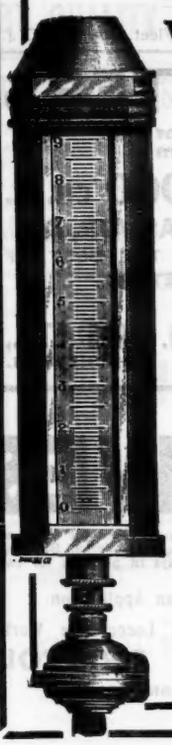

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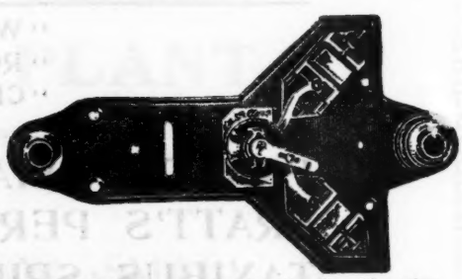

View of Gas Passage showing the Top Mounting.

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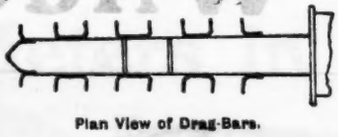
ALL INTRICATE MECHANISM IS AVOIDED.

Drag-Bars carrying Coal.



Plan View of Drag-Bars.

Drag-Bars leaving Coal in Retort.

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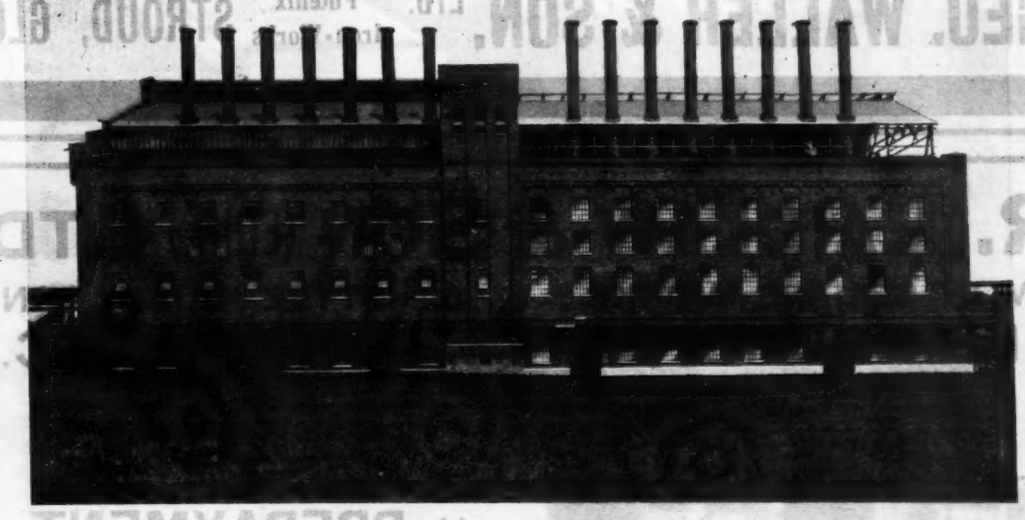

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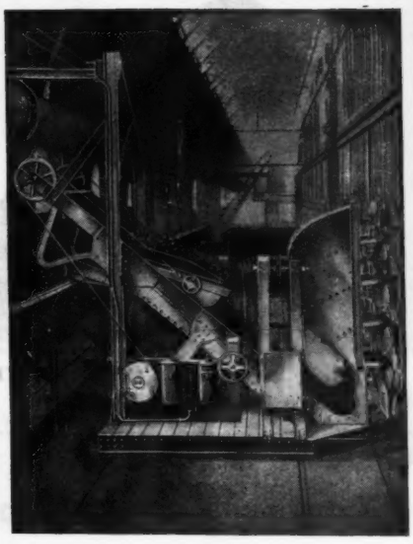

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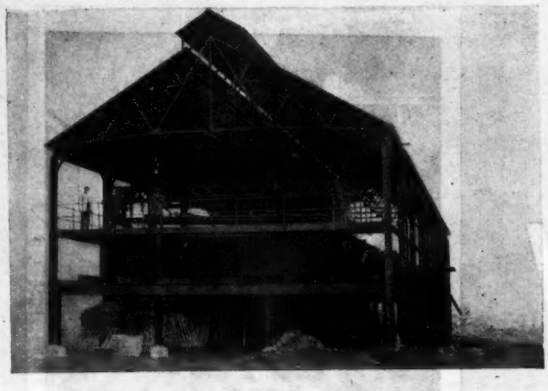

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